ALPINE FLORA

FOR TOURISTS AND AMATEUR BOTANISTS

HOFFMANN

Fl. 50

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FOR TOURISTS AND AMATEUR BOTANISTS

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WITH TEXT DESCRIPTIVE OF

THE MOST WIDELY DISTRIBUTED AND ATTRACTIVE ALPINE PLANTS

BY

DR. JULIUS HOFFMANN

TRANSLATED BY

E. S. BARTON (MRS. A. GEPP)

WITH 43 PLATES

CONTAINING 283 COLOURED FIGURES

MOSTLY FROM WATER-COLOURED SKETCHES BY HERMANN FRIESE

NEW EDITION

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PREFACE.

Every one who is at all interested in the plant-world finds a special attraction in the peculiar and richly-coloured Flora of the Alps.

Many thousands travel yearly from far and near to enjoy their "summer holiday" in the Alps, to inhale the sweet mountain air, and to absorb the mighty impressions of majestic Nature in the mountains. Of these, many are entranced by the lovely floral decoration of the High Alps and become desirous of making themselves better acquainted with the many gay forms of the Alpine Flora. They soon realise that besides "Alpenrosen" (Rhododendron) and "Edelweiss," the favourite well-known types of the mountain-flora, there are many other genera which find their home only in the mountains, where their blossoms sometimes stand so close together as practically to form a covering for pastures, meadows and rocks. Such floral carpets, which are often quite characteristic of the landscape, fascinate by their brilliant colouring even the eyes of those who take but a moderate interest in the more scattered flora of their own native land; indeed, in the mountains most people who observe and care for Nature unconsciously acquire an enthusiastic interest in plants.

Azure-blue gentians, golden-yellow and white ranunculus, variegated pansies, primroses, pinks, saxifrages, etc., fasten the interest of the Alpine wanderer and inspire him with a wish to form a closer acquaintance with the individual species.

It is, then, to such amateur botanists that our Alpine Flora is dedicated, namely, to those whose wish is not so much to study scientific botany as to become acquainted with the most obvious forms of the mountain-flora, both from an appreciation of their beauty and from a general love of knowledge. Our object is to offer to such people a small, cheap handbook, which will enable them to recognise easily the most important Alpine plants.

It was therefore necessary from the first to limit the number of the genera to be figured and described, and to omit many of the rarer species, which occur in but few localities. A large number of plants, which do not belong *exclusively* to the mountains, but occur just as frequently in the Subalps and in the hilly districts of Mid-Europe, had also to be passed over. Moreover, little or no attention has been paid to numerous genera belonging to those families in which the amateur is known to take but slight interest; for instance, Umbelliferæ, many Compositæ (*Hieracium*, *Crepis*, *Senecio*, etc.), the grasses, rushes, sedges, etc., since a more detailed study is necessary to enable one to determine members of these difficult families. This limitation will doubtless be welcome to amateurs, and is in keeping with the popular character of our book, which is not intended as a foundation for strictly

scientific studies, but as an introduction to the gay and lovely flora of the High Alps.

With this object in view the text is made as short and as clear as possible, especially in the case of those plants which are figured; for the beginner will find it much easier and less tedious to become acquainted with plants by means of coloured illustrations which are faithful to Nature than by detailed descriptions, which are more likely to frighten away than to satisfy the amateur. It seemed, therefore, better to mention only those more important characteristics which are best calculated to distinguish the respective plants from their allies. The arrangement of the Families is based on De Candolle's system.

Most of the plates contained in the book are careful reproductions in colour of original water-colour drawings by Hermann Friese. A large number of the figures were painted from Nature. The works mentioned in the following list have been used for reference. The first three, the titles of which are printed in blacker type, are more comprehensive in their scope; and these we would specially recommend to those botanists who may wish to make a closer study of Alpine plants.

Flora von Deutschland, herausg. v. Dr. v. Schlechtendal, Dr. Langethal und Dr. E. Schenk. 5 Aufl. revidiert von Dr. E. Hallier. 30 Bände. Verlag von. Fr. v. Zezschwitz in Gera.

Die Alpenpflanzen, nach der Natur gemalt von Jos. Seboth, mit Text von Ferd. Graf und Joh. Petrasch. 4 Bände, 400 Chromol. Tafeln. Verlag von E. Tempsky in Prag u. G. Freytag in Leipzig. [English edition:—Alpine Plants, by Alfred W. Bennett. 4 vols. Swan Sonnenschein.]

Atlas der Alpenflora. Nach der Natur gemalt v. Ant. Hartinger, mit Text von Professor Dr. K. W. v. Dalla Torre (4 Bände mit 500 chromolith. Tafeln). Wien, Eigentum u. Verl. d. Deutschen u. Oesterr. Alpenvereins.

Die Alpenpflanzen Deutschlands und der Schweiz von J. C. Weber. 4 Bände (400 kol. Tafeln). Verlag von Chr. Kaiser in München.

Taschenflora des Alpenwanderers, von Dr. C. Schröter u. Ludw. Schröter. Mit 24 farbigen und 2 schwarzen Tafeln. Zürich, Verlag von Alb. Raustein.

Das Pflanzenleben der Schwäbischen Alb. von Dr. Rob. Gradmann, 2 Bände mit 50 Chromotafeln. Tübingen, 1900, Verlag des Schwäbischen Albvereins.

TRANSLATOR'S PREFACE.

In translating this work an endeavour has been made to retain so far as possible the popular character of the original, but to ensure accuracy it was found necessary to employ certain simple botanical terms, which are explained in the glossary.

Many of the German plant-names are retained, in the hope that they may prove of use in eliciting information from the guides and countryfolk of the Alpine districts. Where it has been possible the English names have also been inserted, but naturally these are few, and it was deemed advisable to introduce the English equivalent of the generic name where such existed. It should be explained that though this generic name has been applied only to the first species of such a genus, it is intended to cover all the remaining species of that genus. For instance, all the species of *Saxifraga* may be termed Saxifrage, though that name appears in the text only against *S. rotundifolia*.

The Metric system has been retained for the altitudes and also for the plant-measurements. The conversion to English measures is easy if the following approximate equivalents are borne in mind:—

1000 ft. = 300 metres.
1 ft. = 30 cm.
1 inch = 2·5 cm. = 25 mm.

PREFACE TO THE SECOND ENGLISH EDITION.

Since the publication of the First English Edition of Dr. J. Hoffmann's "Alpenflora" a Second German Edition has appeared under the editorship of Professor K. Giesenhagen of Munich. In this second edition one of the original plates has been omitted and four new ones added with corresponding text. The new plates deal with Rushes and Sedges, Grasses, Ferns, Lycopods, Mosses and Lichens.

Advantage has been taken of the opportunity afforded by a demand for a reprint of the English Edition to include this new matter. It is hoped that the inclusion of these new plates and the descriptive text relating to these interesting plants will be welcome to tourists and other lovers of the beautiful Flora of the Alps.

LIST OF PLATES.

I.

FACE PAGE

1. Atragene alpina ; 2. Thalictrum alpinum ; 3. Anemone alpina ; 4. Anemone sulfurea ; 5. Anemone narcissiflora - - - - - 2

II.

1. Anemone vernalis ; 2. Anemone baldensis ; 3. Ranunculus rutaefolius ; 4. Ranunculus pyrenaeus ; 5. Ranunculus parnassifolius ; 6. Ranunculus glacialis - - - - - - - - - - - - - 4

III.

1. Ranunculus alpestris ; 2. Ranunculus crenatus ; 3. Ranunculus aconitifolius ; 4. Ranunculus Thora ; 5. Ranunculus montanus - - - 6

IV.

1. Trollius europaeus ; 2. Aquilegia alpina ; 3. Aconitum Napellus ; 4. Aconitum Anthora - - - - - - - - - - - - 8

V.

1. 2. Papaver alpinum ; 3. Nasturtium pyrenaicum ; 4. Arabis alpina ; 5. Arabis coerulea ; 6. Arabis pumila ; 7. Cardamine alpina ; 8. Braya alpina - - - - - - - - - - - - - - 10

VI.

1. Alyssum Wulfenianum ; 2. Petrocallis pyrenaica ; 3. Draba aizoides ; 4. Draba Hoppeana ; 5. Thlaspi alpinum ; 6. Thl. rotundifolium ; 7. Biscutella laevigata - - - - - - - - - - - - 14

VII.

1. Hutchinsia alpina ; 2. Helianthemum alpestre ; 3. Viola pinnata ; 4. Viola biflora ; 5. Viola calcarata ; 6. Viola alpina - - - - 16

VIII.

1. a. b. Polygala Chamaebuxus ; 2. Gypsophila repens ; 3. Dianthus alpinus ; 4. Dianthus inodorus ; 5. Dianthus glacialis - - - - 18

IX.

1. Saponaria ocymoides ; 2. Saponaria Pumilio ; 3. Silene rupestris ; 4. Silene saxifraga ; 5. Silene acaulis ; 6. Viscaria alpina - - - 22

X. FACE PAGE

1. Alsine verna ; 2. Alsine laricifolia ; 3. Cherleria sedoides ; 4. Möhringia muscosa ; 5. Arenaria biflora ; 6. Arenaria grandiflora - - - - 24

XI.

1. Arenaria ciliata ; 2. Cerastium latifolium ; 3. Cerastium alpinum ; 4. Linum alpinum ; 5. Hypericum Coris - - - - - - - - 26

XII.

1. Geranium macrorrhizum ; 2. Trifolium alpinum ; 3. Trifolium pallescens ; 4. Trifolium badium ; 5. Phaca frigida ; 6. Phaca alpina - - 28

XIII.

1. Oxytropis campestris ; 2. Oxytr. montana ; 3. Astragalus australis ; 4. Astragalus alpinus ; 5. Hedysarum obscurum ; 6. Dryas octopetala 30

XIV.

1. Geum montanum ; 2. Geum reptans ; 3. Potentilla nitida ; 4. Potent. Clusiana ; 5. Potent. grandiflora ; 6. Potent. frigida - - - 34

XV.

1. Rosa alpina ; 2. Aronia rotundifolia ; 3. Epilobium rosmarinifolium ; 4. Herniaria alpina ; 5. Sedum roseum ; 6. Sedum annuum - - 36

XVI.

1. Sempervivum arachnoideum ; 2. Semperv. Wulfeni ; 3. Semperv. montanum ; 4. Saxifraga rotundifolia ; 5. Sax. stellaris ; 6. Sax. Seguieri ; 7. Sax. androsacea - - - - - - - - - - - - 38

XVII.

1. Saxifraga aizoides ; 2. Sax. bryoides ; 3. Sax. caesia ; 4. Sax. Aizoon ; 5. Sax. Burseriana ; 6. Sax. oppositifolia ; 7. Sax. biflora ; 8. Zahlbrucknera paradoxa - - - - - - - - - - - - 42

XVIII.

1. Hacquetia Epipactis ; 2. Astrantia major ; 3. Eryngium alpinum ; 4. Bupleurum ranunculoides ; 5. Ligusticum Mutellina ; 6. Linnaea borealis - - - - - - - - - - - - - 44

XIX.

1. Valeriana supina ; 2. Adenostyles alpina ; 3. Homogyne alpina ; 4. Aster alpinus ; 5. Bellidiastrum Michelii ; 6. Erigeron alpinus ; 7. Erig. uniflorus - - - - - - - - - - - - 48

XX.

1. Leontopodium alpinum ; 2. Gnaph. supinum ; 3. Gnaph. norvegicum ; 4. Artemisia Mutellina ; 5. Art. spicata ; 6. Achillea moschata ; 7. Ach. atrata ; 8. Ach. nana - - - - - - - - - 50

XXI.

1. Chrysanthemum alpinum ; 2. Achillea oxyloba ; 3. Doronicum cordatum ; 4. Aronicum glaciale ; 5. Arnica montana - - - - 54

XXII. FACE PAGE

1. Senecio abrotanifolius ; 2. Senecio Doronicum ; 3. Senecio incanus ; 4. Saussurea alpina ; 5. Aposeris foetida ; 6. Leontodon pyrenaicus - 53

XXIII.

1. Hypochoeris uniflora ; 2. Mulgedium alpinum ; 3. Crepis aurea ; 4. Crepis jubata ; 5. Crepis alpestris - - - - - - - - 58

XXIV.

1. Hieracium aurantiacum ; 2. Hier. alpinum ; 3. Hier. villosum ; 4. Phyteuma comosum ; 5. Phyt. pauciflorum ; 6. Phyt. hemisphaericum - 60

XXV.

1. Campanula Zoisii ; 2. Camp. thyrsoidea ; 3. Camp. pusilla ; 4. Camp. pulla ; 5. Camp. barbata - - - - - - - - - - 62

XXVI.

1. Vaccinium Vitis idaea ; 2. Arctostaphylos alpina ; 3. Arctost. Uva ursi ; 4. Erica carnea ; 5. Loiseleuria procumbens ; 6. Rhodothamnus Chamaecistus - - - - - - - - - - - - 64

XXVII.

1. Rhododendron ferrugineum ; 2. Rhodod. hirsutum ; 3. Pyrola secunda ; 4. Pyrola uniflora ; 5. Gentiana acaulis ; 6. Gentiana bavarica - - 68

XXVIII.

1. Gentiana lutea ; 2. Gentiana purpurea ; 3. Gentiana punctata ; 4. Gentiana asclepiadea ; 5. Gentiana frigida - - - - - 70

XXIX.

1. Gentiana pumila ; 2. Gent. brachyphylla ; 3. Gent. verna ; 4. Gent. utriculosa ; 5. Gent. nivalis ; 6. Gent. prostrata ; 7. Gent. ciliata ; 8. Gent. nana - - - - - - - - - - - - 72

XXX.

1. Polemonium caeruleum ; 2. Myosotis alpestris ; 3. Eritrichium nanum ; 4. Erinus alpinus ; 5. Linaria alpina - - - - - - - 74

XXXI.

1. Veronica fruticulosa ; 2. Veron. fruticans ; 3. Veron. alpina ; 4. Veronica Bonarota ; 5. Wulfenia Carinthiaca ; 6. Tozzia alpina ; 7. Pedicularis rostrata - - - - - - - - - - - - - 76

XXXII.

1. Pedicularis verticillata ; 2. Pedic. incarnata ; 3. Pedic. recutita ; 4. Pedic. tuberosa ; 5. Pedic. Oederi ; 6. Bartschia alpina - - 80

XXXIII.

1. Horminum pyrenaicum ; 2. Calamintha alpina ; 3. Pinguicula vulgaris ; 4. Pinguic. alpina ; 5. Androsace imbricata ; 6. Andros. helvetica ; 7. Andros. glacialis ; 8. Andros. carnea ; 9. Andros. villosa ; 10. Douglasia vitaliana - - - - - - - - - - - - 82

XXXIV. FACE PAGE

1. Primula farinosa ; 2. Primula Auricula ; 3. Primula longiflora ; 4. Primula villosa ; 5. Primula glutinosa ; 6. Cortusa Matthioli - 84

XXXV.

1. Soldanella alpina ; 2. Cyclamen europaeum ; 3. Globularia cordifolia ; 4. Armeria alpina ; 5. Polygonum viviparum ; 6. Daphne striata ; 7. Daphne Cneorum - - - - - - - - - - - 88

XXXVI.

1. Thesium alpinum ; 2. Empetrum nigrum ; 3. Salix reticulata ; 4. Sal. herbacea ; 5. Orchis ustulata ; 6. Orchis globosa ; 7. Anacamptis pyramidalis ; 8. Ophrys muscifera - - - - - - - - - 90

XXXVII.

1. Gymnadenia conopea ; 2. Gymnad. albida ; 3. Platanthera bifolia ; 4. Nigritella nigra ; 5. Epipactis latifolia ; 6. Listera ovata ; 7. Spiranthes spiralis ; 8. Cypripedium Calceolus - - - - - - - 94

XXXVIII.

1. Crocus vernus ; 2. Lloydia serotina ; 3. Erythronium Dens-canis ; 4. Paradisia Liliastrum ; 5. Gagea Liottardi ; 6. Lilium Carniolicum - 96

XXXIX.

1. Allium victoriale ; 2. Veratrum album ; 3. Tofieldia palustris ; 4. Luzula lutea ; 5. Eriophorum Scheuchzeri - - - - - - - - 98

XL.

1. Trichophorum caespitosum ; 2. Carex curvula ; 3. Carex firma ; 4. Nardus stricta ; 5. Phleum alpinum ; 6. Avena versicolor ; 7. Poa alpina ; 8. Sesleria caerulea - - - - - - - - - - - 100

XLI.

1. Allosorus crispus ; 2. Asplenium viride ; 3. Asplenium trichomanes ; 4. Asplenium ruta muraria ; 5. Asplenium septentrionale ; 6. Cystopteris regia alpina ; 7. Botrychium lunaria ; 8. Lycopodium selago ; 9. Selaginella helvetica ; 10. Selaginella denticulata - - - - - 102

XLII.

1. Sphagnum ; 2. Andreaea petrophila ; 3. Dicranoweisia crispula ; 4. Grimmia alpestris ; 5. Rhacomitrium canescens ; 6. Splachnum sphaericum ; 7. Splachnum ampullaceum ; 8. Polytrichum alpinum ; 9. Polytrichum juniperinum ; 10. Brachythecium glaciale ; 11. Conocephalus conicus ; 12. Preissia commutata. - - - - - - - - - - 106

XLIII.

1. Usnea barbata ; 2. Cladonia rangiferina ; 3. Cladonia pyxidata ; 4. Cladonia bellidiflora ; 5. Thamnolia vermicularis ; 6. Cetraria islandica ; 7. Solorina crocea ; 8. Verrucaria calciseda ; 9. Verrucaria dolomitica ; 10. Rhizocarpon geographicum - - - - - - 110

I. Family: Ranunculaceæ.

Atragene alpina *L.* (Linnæus). *Gemeine Alpenrebe.* Plate 1, Fig. 1.—Strongly growing, woody, climbing plant. Leaves long-stalked, 3-foliolate. The 4 sepals blue or violet. Petals numerous, yellowish, spatulate. —On rocky slopes and in woods throughout the entire Alpine region, up to 1800 m., but scattered; preferably on calcareous soils. Fl. June, July.

Thalictrum aquilegifolium *L. Akeleiblätterige Wiesenraute* (Meadow Rue).—Shrub 30-90 cm. high. Leaves long-stalked, 3 times tripartite, resembling the leaves of *Aquilegia*. Sepals light green with red veins; the numerous, long, violet-red stamens give to the umbel-like panicle an elegant, glaucous appearance.—Subalpine and Alpine, up to 1800 m., in woodland- and mountain-meadows. Fl. May, June.

Thalictrum alpinum *L.* Plate 1, Fig. 2.—Small plant, 5-15 cm. high, with greenish flowers.—On stony slopes of the highest Alps, Switzerland, Tyrol, Styria, 2000-2500 m. Scattered and sparse. Fl. June, July.

Thalictrum foetidum *L.*—30-60 cm. high, stem and leaves covered with *soft*, erect, glandular hairs. Flowers in a loose panicle, long-stalked, cernuous, light green.—On

rocks of the Alps and Subalps, Switzerland to Styria, up to 1800 m. Fl. June, July.

Anemone alpina *Miller.* *Alpen-Anemone* (Wind-flower). Plate 1, Fig. 3.—Varies in height from 10-30 cm., according to its locality; generally only 20 cm. high. Sepals 6-8, white, sometimes tinged with lilac, covered externally with silky hairs.—In Alpine pastures on limestone mountains, at a height of 1600-2800 m., from Switzerland throughout the entire Alpine chain; also in the Vosges, the Sudeten, and on the Brocken. Fl. June to August.

Anemone sulfurea *L.* *Gelbe Alpen-Anemone.* Plate 1, Fig. 4.—By most botanists regarded as a variety of the last species. Absent from limestone mountains, and indigenous on primary rock (gneiss, mica-schist, etc.) at an altitude of 1300-1800 m.

Anemone narcissiflora *L.* Plate 1, Fig. 5.—The white flowers, tinged with red, mostly 5-7, form a loose umbel, which rises from a whorl of deeply cut involucral leaves. Radical leaves almost circular in general outline, 5-partite, each single division doubly trifid.—Distributed over the entire Alpine chain and Subalps, as well as the central ranges of South and Middle Europe. On Alpine meadows and grassy slopes. Fl. May to July.

Anemone trifolia *L.*—Much resembling the common Wood-Anemone or Wind-flower (*A. nemorosa L.*). Flowers white, rarely light blue. The three leaves, usually absent at the time of flowering, are 3-partite with sharply serrate edge, somewhat hairy along the

1. Anemone alpina. 2. Pulsatilla vernalis. 3. Anemone alpina.
4. Anemone sulphurea. 5. Pulsatilla montana.

nerves and veins.—Southern Alpine chain, Tyrol to Carniola, in woods of the Subalps and on mountains up to an altitude of 1600 m. Fl. April to July.

Anemone Halleri *Allioni*.—Resembling the common *Anemone pulsatilla L.*, which flowers in April; 10-15 cm. high, villose. The radical leaves, which die off in autumn, are twice or thrice pinnatisect, with linear-lanceolate segments. Flowers deep violet.—Southern Switzerland, Styria, Austria, Southern Bohemia, to an altitude of 1500 m. Fl. July, August.

Anemone vernalis *L.* Plate 2, Fig. 1.—6-12 cm. high. Radical leaves simply pinnate; the pinnae ovate, trifid with undivided or 2-3 toothed segments. Flowers white, tinged externally with lilac or violet, villose.—Frequent in dry Alpine pastures, from Switzerland to Styria, at an altitude of 1200-2300 m. (Also in the Carpathians, Scandinavia, and in pine-woods of the North German plain.) Fl. May, June, July.

Anemone baldensis *L.* Plate 2, Fig. 2.—10-15 cm. high. Leaves palmate, twice 3-5-partite. The petals, mostly 9, are white, and violet on the villose, dorsal side. The fruit-head resembles a whitish strawberry.—In dry places in the High Alps, scattered throughout the entire Alpine chain at an altitude of 1800-2400 m. Fl. June, July.

Ranunculus rutaefolius *L.* *Rautenblätteriger Hahnenfuss* (Buttercup, Crowfoot). Plate 2, Fig. 3.—Elegant little herb, with stem 6-12 cm. high, often procumbent, bearing 1-3 flowers and doubly pinnati-

partite leaves, which resemble those of *Thalictrum*. Petals 5-12, greenish-white, with a golden-yellow spot at the base.—On limestone and primary rock distributed throughout the entire Alpine chain, frequent; 1900-2500 m. Fl. July, August.

Ranunculus anemonoides *Zahlbruckner*.—Much resembling the last species, but the whole plant stronger and taller. Height 15-20 cm. The 7-15 white petals are narrower and more elongate.—While the last species occurs in the high Central Alps, this is confined to the Subalps of South Tyrol, Lower Austria and Styria, and is found principally in rocky places in pine-woods. Fl. March and April.

Ranunculus pyrenaeus *L.* Plate 2, Fig. 4.—Stem 8-18 cm. high, mostly 1-flowered. Leaves narrow-lanceolate, entire, bluish-green.—Pyrenees and Alpine chain; 1800-2700 m.; in moist pastures, abundant locally. Fl. June, July.

Ranunculus parnassifolius *L.* Plate 2, Fig. 5.—Stem 8-12 cm. high. Radical leaves cordate-ovate, long-stalked, entire. Flower-stalks and stem woolly. Flower white.—In stony pastures and meadows of the Pyrenees and of the Alpine chain, 2500-3000 m., scattered. Fl. July, August.

Ranunculus glacialis *L.* Plate 2, Fig. 6.—Stem 2-10 cm. high, bearing at the base a rosette of stalked, 3-5-fid leaves, divided into lanceolate segments; root-stock *without* tufts of root-hairs. Calyx villose with dark reddish-brown hairs. Flowers white, mostly tinged

1.
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with rose-red, especially externally.—Distributed over primary rocks of the Alpine chain, at an altitude of 2300-4200 m. According to Dr. C. Schröter, "it reaches a higher altitude than any other flowering plant in Switzerland". Fl. July, August.

Ranunculus Seguieri *Villars.* — Much resembling the last species, but each individual segment of the pinnate leaves is acuminate and the sepals are not villose but glabrous.—South Tyrol and Carniola, scattered, on limestone mountains at an altitude of 1900-2300 m. Fl. July, August.

Ranunculus roseus *Hegetschweiler.*—Also much resembling *R. glacialis*, but the flowers are deep rose-red and the root-stock is markedly tufted with root hairs.—On the High Alps of Switzerland, 2500-2700 m. Fl. July, August.

Ranunculus alpestris *L.* Plate 3, Fig. 1.—An elegant plant, 5-15 cm. high, with succulent, mostly 1-flowered stems. The radical, long-stalked leaves are 3-5-fid, with 5 canaliculate nerves, in general outline reniform, but coarsely cuneate-crenate; dark green, very glossy. On the stem are mostly 1 or 2 lanceolate leaflets, which are entire, more rarely tripartite. Calyx glabrous. Flower up to 2 cm. broad, the 5 petals white, glossy, yellowish at the base.—Distributed over the entire Alpine chain at 1000-2000 m., frequent; also in the Jura and on the Carpathians. Especially abundant in hollows, in which the snow remains for a long time. Fl. June, July.

Ranunculus Traunfellneri *Hoppe.*—Much resembling the last species, but more slender, often only 3 cm. high, always 1-flowered, with one entire, more rarely 2-fid stem-leaf. Flower-stalk at the most 10 cm. high. Flowers white like those of the last species, traversed by longitudinal veins. Sepals greenish-yellow, glabrous.—Distribution the same as the last, but this species is much rarer, and occurs more as solitary individuals, not gregariously. Fl. June to September.

Ranunculus crenatus *Waldstein and Kitaibel.* Plate 3, Fig. 2.—6-12 cm. high. Radical leaves rather long-stalked, subrotundate-cordate to reniform, distinctly crenate, up to 2 cm. broad, petioles dilated at the base into broad sheaths. Stem bearing 1-2 flowers, with 1-2 ligulate leaflets. Calyx glabrous. The conspicuous flower white, with five roundish ovate, slightly emarginate petals. —On granite Alps of Styria and South Tyrol, sparsely distributed, at an altitude of 1100-2000 m. Fl. July, August.

Ranunculus aconitifolius *L. Eisenhutblätteriger Hahnenfuss.* Plate 3, Fig. 3.—Glabrous, herbaceous plant, 60-130 cm. high. Radical leaves very long-stalked, 3-7-partite, palmately expanded, the segments 3-fid, acuminate, inciso-serrate. Stem repeatedly divided into slender branches bearing numerous flowers, at the base of which stand palmately expanded leaves. Flowers white, composed of five small, white, deciduous petals.—Distributed over the mountain-woods of the entire Alpine chain, up to 1800 m. on limestone and primary rock, frequent; also in mountain-regions of North and South Europe, as well as in the central mountain-ranges of Germany and Austria. Fl. May to August.

1. Ranunculus alpestris. 2. Ranunculus crenatus. 3. [illegible]
4. [illegible] 5. Ranunculus montanus.

Ranunculus Thora *L. Gifthahnenfuss.* Plate 3, Fig. 4.—A small plant, which in the higher Alps grows to only 8-10 cm., in the Subalps to 20-25 cm. The root-stock consists of a bundle of napiform tubers. Stem 1-2-flowered, with one large lower stem-leaf, which is reniform, finely veined, crenate at the edge and glossy green. The upper stem-leaf is small, 2-3-partite, with tapering lobes. Flowers 1-3, golden-yellow, glossy.—Distributed over Alpine pastures, and in mountain-woods of Middle and South Europe, Switzerland, Tyrol, Styria, Carniola, up to an altitude of 1900 m. Scattered. Fl. May, June. *Very poisonous.*

Ranunculus pygmaeus *Wahlenberg.*—A minute plant with a stem only 1·5-3 cm. high, mostly simple with one leaf and one flower; stem at the time of flowering scarcely longer than the stalked, 3-5-partite, radical leaves. Sepals glabrous, somewhat reflexed, longer than the five yellow petals, which are only 4-5 mm. wide.—On primary rock in Tyrol, Salzburg, Carinthia, at an altitude of 2200-2500 m. Rare and scattered. Also in the far North (Scandinavia, Lapland, Spitzbergen). Fl. July, August.

Ranunculus montanus *Willdenow.* Plate 3, Fig. 5.—Stem 6-12 cm. high, closely covered like the leaf-stalks with erect hairs. Radical leaves palmately divided, with obovate, trifid, bluntly toothed segments. Lowest stem-leaf 5-6-partite, the upper one 2-5-fid, with linear, divaricate segments. Stem 1-3-flowered. Flowers golden-yellow.—Distributed generally over the Alps and Subalps, especially on limestone, at an altitude of 1500-2500 m., frequent; also in the central mountains of South Germany

(Black Forest, Swabian Alb, etc.) here and there. Fl. from May to August.

Trollius europaeus *L. Gemeine Trollblume* (Globe-flower). Plate 4, Fig. 1.—A glabrous, upright plant, generally 30-60 cm. high, with sparingly branched stem. The radical leaves are palmately divided into 3 or 5 leaflets, which are again lobed and incised. The few stem-leaves are small, almost sessile. Flowers large, lemon-yellow, with 10-15 large, globosely convergent sepals, which enclose the small petals, stamens and pistil.—In damp mountain-meadows all over Europe, in the Alps up to an altitude of 2400 m. A small, 1-flowered form, only 20 cm. high (var. *humilis Crtz.*), is found only on high mountains. Fl. from May to July.

Eranthis hiemalis *Salisbury. Gemeiner Winterstern* (Winter Aconite).—Stem 5-12 cm. high, 1-flowered. The golden-yellow flowers, surrounded by a whorl of deeply incised green leaves, have 5-8 petaloid sepals and 6-8 short, tubular petals. Radical leaves long-stalked, 3-7-partite. — Distributed over the Alpine chain, but scattered and rare. Often, however, planted in gardens. Fl. February, March.

Helleborus niger *L. Schwarze Niesswurz, Christblume* (Christmas Rose). — Radical leaves pedately divided, with 8-9 lobes, glossy green. Stem 12-16 cm. high, 1-2-flowered. The conspicuous flowers white, tinged with red underneath.—Here and there in shady mountain-woods, up to an altitude of 1800 m. Fl. December to February, hence a favourite winter plant in gardens. *Poisonous.*

1. Trollius europaeus. 2. Aquilegia alpina. 3. Aconitum Napellus
4. Aconitum Anthora.

Aquilegia alpina *L.* *Alpen-Akelei* (Columbine). Plate 4, Fig. 2.—Magnificent alpine plant, distinguished by its large sky-blue flowers. Stem 1-3-flowered, 15-30 cm. high.—West and Central Alps, eastern limit being the Engadine; scattered and generally rare, up to an altitude of 1600 m. Fl. July, August.

Aquilegia atrata *Koch.* *Schwärzlicher Akelei.*—Flower-stalk 30-40 cm. high, 3-10-flowered. Flowers black-violet or purple brown. Spur of the petals rolled almost into a circular spiral.—This Columbine, which is widely, and in places abundantly, distributed over the Alps and Subalps, is regarded by many botanists as an Alpine form of the Common Columbine (*A. vulgaris L.*), which is indigenous in open, hilly woodlands of Middle Europe. Fl. June, July.

Delphinium elatum *L.* *Hoher Rittersporn* (Larkspur).—This beautiful Larkspur, 100-150 cm. high, bears 5-fid stem-leaves, the segments of which are 3-fid, broad and inciso-serrate; under each flower-stalk are 2 linear bracts. Corolla consists of 4 petals, the limb of the two lower petals 2-fid and bearded, the two upper petals spurred. Calyx blue, corolla dirty-grey.—Distributed over the Alpine chain up to 1600 m., especially by streams and in damp pastures; also in the mountains of Bohemia and Silesia. Fl. June, July.

Aconitum Napellus *L.* *Echter Eisenhut* (Monkshood). Plate 4, Fig. 3.—Stem 45-130 cm. high. The dark-blue flowers form a conspicuous terminal raceme, the dark-green leaves are divided to the base into 5-7 segments.—Distributed over mountain-regions in Middle and South

Europe; in the Alps to an altitude of 2000 m., frequent. Fl. June to August. *Poisonous.*

Aconitum Anthora *L.* Plate 4, Fig. 4.—Stem 30-60 cm. high. The whitish-yellow flowers form a loose, few-flowered raceme. The leaves are multipartite pinnatifid, with narrow acuminate terminal-segments.—Scattered over the entire Alpine chain, especially in the Jura, in the Alps of Austria and Carniola, Savoy, Pyrenees, up to an altitude of 1800 m. Fl. July, August. *Poisonous.*

Paeonia officinalis *L. Gemeine Pfingstrose* (Peony). —Stem 50-80 cm. high, flowers purple-red, radical leaves twice ternate. This is the original form of various, partly doubled Garden Peonies, and is indigenous in the Alps of South Switzerland, South Tyrol and Carniola. Fl. in June.

II. Family: Papaveraceæ.

Papaver alpinum *L. Alpen-Mohn* (Alpine Poppy). Plate 5, Figs. 1 and 2.—Stem 10-25 cm. high, 1-flowered, leafless. Sepals 2, soon fugacious. The four petals are white, often yellow at the base, or all yellow. Leaves twice or thrice pinnatipartite.—Distributed over the entire Alpine chain; in stony, dry places, frequent and abundant, up to an altitude of 2700 m. Fl. from June to August.

Papaver pyrenaicum *L.*—Much resembling the last species, but of closer growth and with less finely-cut, more rough-hairy leaves. Flowers yellow.—Alpine chain, on schist and limestone, to an altitude of 2700 m. Fl. July, August.

1. 2. Papaver alpinum. 3. Nasturtium pyrenaicum. 4. Arabis alpina.
5. Arabis coerulea. 6. Arabis pumila. 7. Cardamine alpina. 8. Braya alpina.

III. Family: Cruciferæ.

Nasturtium pyrenaicum *Rob. Brown. Pyrenäische Brunnenkresse.* Plate 5, Fig. 3.—Stem 10-30 cm. high. Lowest leaves long-stalked, oval, simple or amplexicaul-auriculate; the lowest stem-leaves lyrate, the upper ones deeply pinnatifid. Siliqua one-third the length of its pedicel.—Switzerland, Pyrenees, Vosges, in dry places, scattered; also in the Elbe valley from Dessau to Magdeburg, in Upper Baden and in Upper Alsace. Fl. from May to August.

Arabis alpina *L. Alpen-Gänsekresse* (Alpine Rock-cress). Plate 5, Fig. 4.—15-25 cm. high, stem procumbent. Flowers white, not numerous, but of considerable size. Petals twice as long as the calyx. Leaves oblong-ovate, rough, with branched hairs. Siliquas spreading, flat.—Alpine chain, from 1300-2200 m., especially on limestone; also scattered in the Riesengebirge, Harz and Westphalia. Fl. May to August.

Arabis caerulea *Haenke. Blaue Gänsekresse.* Plate 5, Fig. 5.—Stem 4-8 cm. high, erect, hairy. Flowers blue, grouped together in a crowded corymb. Leaves slightly ciliate, glossy, with 3-5 teeth towards the top. Radical leaves spatulate, stem-leaves smaller, sessile, semi-amplexicaul. Siliquas erect.—Scattered over the Alpine chain, preferably on limestone, 1900-2500 m. Fl. July, August.

Arabis pumila *Jacquin.* Plate 5, Fig. 6.—Stem 5-15 cm. high, with 2-3 leaves, and usually with scattered hairs. Flowers white, calyx with a white border. Leaves bearing shining, stellate hairs, the radical leaves ciliate at

the edge, the stem-leaves spreading, oblong-oval, sessile, rounded at the base.—Alpine chain, in dry places, especially on limestone, to an altitude of 2000 m. Fl. June, July.

Cardamine alpina *Willd. Alpen-Schaumkraut* (Alpine Bittercress). Plate 5, Fig. 7.—Plant 3-8 cm. high. Radical leaves long-stalked, entire, bluntly ovate; stem-leaves short-stalked, lanceolate-rotundate, rarely 3-lobed. The white petals twice as long as the calyx. Anthers yellow. The upright siliquas are set close together and form a short, stiff raceme.—Alpine chain, to an altitude of 2500 m., especially on primary rock. Fl. June, July.

Cardamine trifolia *L.*—Stem 10-30 cm. high. Leaves on a long petiole, tripartite, rhomboid-subrotundate, repando-crenate. Petals white.—In damp woods of the South-Eastern Alps (up to an altitude of 1500 m.) and of their Subalps, especially in Tyrol, Carinthia, Styria, Austria, Bavaria, Bohemia, Silesia. Fl. May, June.

Dentaria digitata *Lamarck. Gefingerte Zahnwurz* (Toothwort). Stem 45-50 cm. high, the thickness of a quill, with 3-4 long-stalked, 5-foliolate leaves, the 4-5 leaflets of which are palmately expanded and sharply serrate at the edge. Flowers rose-red to lilac, 8-10 in a corymb, the lower ones long-stalked.—In mountain-woods of the Alpine chain, also in the Jura, in Alsace and in Upper Swabia. Fl. May to July.

Braya alpina *Sternberg and Hoppe. Schotenkresse.* Plate 5, Fig. 8.—Several stems, 2-7 cm. high, arise from the root-stock, which forms a thick tuft. Leaves linear-lanceolate, only 1-2 cm. long, hairy, entire or slightly

toothed. Flowers white (when dried violet), in a close corymb.—On the slopes of the highest Alps, in the Gamsgrube and Leiter, near Heiligenblut (Carinthia), and on the Solstein, near Innsbruck. Fl. July, August.

Alyssum Wulfenianum *Bernhardi. Wulfen's Steinkraut.* Plate 6, Fig. 1.—A low, Alpine plant, not much exceeding 10 cm. high, out of the creeping, woody stem of which arise several branches. Leaves 6-8 mm. long, obovate, shortly acuminate at the tip. The bright, lemon-yellow flowers form a corymb. Stamens with pointed wings.—On primary rock in Switzerland, Tyrol, Carinthia, Carniola, on rocky slopes, to an altitude of 1700 m. Fl. July, August.

Petrocallis pyrenaica *R. Br. Pyrenäischer Steinschmückel.* Plate 6, Fig. 2.—Small herb, forming a low, thick cushion. Leaves crowded into small fascicles, thick, cuneate, 3-5-fid at the point, ciliate at the edge. Calyx bordered with red. Flowers rose-red to lilac, rarely white.—Distributed over the entire Alpine chain to an altitude of 2800 m., especially frequent on limestone. Fl. June, July.

Draba aizoides *L. Immergrünes Hungerblümchen* (Whitlow-grass). Plate 6, Fig. 3.—Stem 5-10 cm. high, leafless. The pointed linear leaves are bright green, ciliate at the edge with stiff hairs and forming thick rosettes. The yellow flowers form a short, few-flowered raceme.—Distributed over the entire Alpine chain, to an altitude of 1900 m., frequent, locally also in Alsace, in the Upper Danube valley, in Upper Swabia and on the Franconian limestone mountains.

Draba Hoppeana *Reichenbach.* (D. Zahlbruckneri Host.) Plate 6, Fig. 4.—Resembling the last species, probably only a dwarf form of it. Stem short, often scarcely rising above the leaf-rosettes, few-flowered, leaves pectinately ciliate.—On the highest granite Alps of Carinthia and Styria. Fl. June to August.

Cochlearia saxatilis *Lamarck. Felsen-Löffelkraut* (Scurvy-grass). Stem up to 30 cm. high, filamentous. The radical leaves, which form a loose rosette, are stalked obovate, slightly toothed; the stem-leaves sessile, linear. The white flowers in a loose corymb. Stamens geniculate; anthers yellow on the dorsal side.—Distributed over the Alpine chain, on limestone rocks and stony detritus, to an altitude of 2200 m. Fl. June to August.

Thlaspi alpinum *Jacquin. Alpen-Täschelkraut* (Pennycress). Plate 6, Fig. 5.—The root-stock is divided into elongated branches, and bears several stems, 5-8 cm. high. The radical leaves, which form a loose tuft, are subrotundate, stalked; the stem-leaves sessile, bluntly auriculate, amplexicaul. The rather large white flowers form a thick corymb.—In meadows and pastures distributed over the Alpine chain, to an altitude of 2500 m. Fl. June, July.

Thlaspi rotundifolium *Gaudin.* Plate 6, Fig. 6. —Stem to 8 cm. high. The root-stock bears several stolon-like branches. Radical leaves stalked, subrotundate-spatulate; stem-leaves amplexicaul with auriculate base. Flowers light violet, sometimes white.—Distributed over the entire Alpine chain, on detritus and shingle of the limestone Alps, to an altitude of 2700 m. Fl. July, August.

1. Alyssum [illegible]. 2. *Petrocallis pyrenaica*. 3. Draba aizoides.
4. Draba [illegible]. 5. Thlaspi alpestre. 6. Thlaspi rotundifolium.
7. Biscutella laevigata.

Biscutella laevigata *L.* *Glattfrüchtige Brillenschote.* Plate 6, Fig. 7.—Stem branched 30-50 cm. high. Lower leaves oblong, toothed, narrowed into the leaf-stalk, upper ones narrow, sessile, with semi-amplexicaul base. Flowers in a semi-globose corymb, golden-yellow. Silicule resembling spectacles, flat, above and below cordate-emarginate, formed of two circular loculi.—On rocks and stony limestone. Distributed over the entire Alpine chain to an altitude of 2200 m.; also scattered here and there in Germany and Austria, and confined to isolated localities. Flowering season, May to August.

Hutchinsia alpina *R. Br.* *Alpen-Gemskresse.* Plate 7, Fig. 1.—Stem 5-10 cm. high, simple, leafless. The root-stock forms a small tuft by means of stolons. Leaves pinnatifid. Petals white, twice as long as the calyx. Silicules oblong, pointed at both ends.—In the stony detritus of Alpine streams, to an altitude of 2700 m., and following the rivers valleywards to Munich and Augsburg. Fl. from May to August.

IV. Family: Cistaceæ.

Helianthemum alpestre *Reichb.* (H. oelandicum Wahlenb.) *Voralpen-Sonnenröschen* (Rock-Rose). Plate 7, Fig. 2.—The stem divides immediately above the root into numerous, procumbent, woody branches, which ascend at the end and become 10-15 cm. high. Leaves opposite, sessile, oblong-oval to linear, without stipules, with bushy hairs at the edge or on both sides, or felted on the under surface. The broad, yellow flowers form short, loose racemes.—Distributed over the limestone

Alpine chain, and frequent in stony, sunny places, to an altitude of 2600 m. Fl. June to August.

V. Family: Violaceæ.

Viola pinnata *L.* *Fiederblätteriges Veilchen* (Violet). Plate 7, Fig. 3.—The root-stock forms no stolons, but a basal tuft of leaves. Leaves palmately divided, with deeply cut divisions and linear segments. Stem 6-8 cm. high, stipules lanceolate, entire. Petals rather small, light violet, the two upper almost as large as the lowest one; spur erect, large. Flowers fragrant.—Alpine chain to Carniola; in meadows, to an altitude of 1800 m. Fl. June, July.

Viola biflora *L.* *Gelbes Veilchen* (Yellow Violet). Plate 7, Fig. 4.—Stem 6-15 cm. high, erect, glabrous, usually 2-leaved and 2-flowered. Leaves reniform, very blunt, crenate. Stipules ovate, entire. Flowers lemon-yellow, striped below with brown-red.—In damp, shady valleys, especially at the foot of wet, overhanging rocks. Distributed over the entire Alpine chain to an altitude of 2000 m., frequent. Also scattered in Bohemia, Saxon Switzerland, Lausitz, Silesia, Westphalia, in the Vosges and in Upper Swabia. Fl. from May to August.

Viola calcarata *L.* *Langsporniges Veilchen.* Plate 7, Fig. 5.—Peduncle arising from a prostrate, branched stem, 4-7 cm. high, each bearing one flower. At the base of the stem is a close fascicle of ovate leaves, of which the lowest are broader, the upper ones narrower. The conspicuous fragrant flower, 2 cm. broad, is blue or violet, rarely yellow or white. The subulate spur is as long as

1. Hutchinsia alpina. 2. Helianthemum alpestre. 3. Vicia pinnata.
4. Viola biflora. 5. Viola calcarata. 6. Viola alpina.

the petals and curved backwards.—In Alpine pastures of limestone Alps, in many places very frequent and abundant, at an altitude of 1800-2700 m., especially in Switzerland and the Bavarian Alps. Fl. July, August.

Viola alpina *L.* Plate 7, Fig. 6.—The short root-stock, which looks as if it were bitten off at the end, bears a short unjointed stem, from which arise the leaves and the 1-2 flower-stalks. Leaves long-stalked, subrotundate-ovate, crenate. Flowers large, sky-blue, rarely white. Spur rather short, saccately swollen at the end.—Eastern Alps, Styria, Austria, at an altitude of 1600 to 1900 m. Fl. June, July.

Viola tricolor *L.* *Stiefmütterchen* (Pansy, Heartsease). —This little plant is distributed over fields, meadows, and waste land throughout the whole of Europe, and exhibits many variations of colour (flowers blue, whitish, or yellow, or a mixture of these three colours). It ascends, also, in the Alps to an altitude of 2000 m. and upwards. A form especially frequent in the Subalps, with particularly bright-coloured flowers, is distinguished as var. *alpestris*. Fl. April to August.

VI. Family: Droseraceæ.

Parnassia palustris *L.* *Sumpf-Herzblatt* (Grass of Parnassus).—Stem 15-30 cm. high. Root-stock short. Radical leaves long-stalked, broadly cordate, entire, glabrous. The stem bears *one* single, sessile leaf in the middle, and *one* conspicuous white flower at the top. Petals obovate, longitudinally streaked with veins, twice as long as the calyx.—In marshes and damp meadows,

frequent, in North and Middle Europe ; in the Alps to an altitude of 2400 m., especially on primary rock. Fl. July, August.

VII. Family : Polygalaceæ.

Polygala Chamaebuxus *L. Immergrüne Kreuzblume* (Milkwort). Plate 8, Fig. 1 (*a*, *b*).—Stem 10-30 cm. high, woody below. Root creeping, stem ascending. Leaves lanceolate or elongate-rotundate, mucronate, leathery, with rolled edges, evergreen. Flower-stalks axillary and terminal, mostly 2-flowered. Flowers rather large, yellow, white when on pure slate, on calcareous slate purple-red. —Widely distributed, but scattered on dry heaths of the central ranges of Germany and Austria. In the Swiss and Austrian Alps to an altitude of 2000 m., locally abundant. Fl. May to August.

VIII. Family : Silenaceæ.

Gypsophila repens *L. Kriechendes Gipskraut.* Plate 8, Fig. 2.—Stem 8-25 cm. long, procumbent at the base, then ascending and branching. Leaves narrow, lanceolate. The white or reddish flowers form a loose, nearly flat corymb. Stamens and pistil shorter than the petals. —Distributed over the entire limestone Alpine chain at an altitude of 1300-2400 m. above sea-level ; also descending with the rivers to the plain, for instance, scattered along the gravelly banks of the Isar, near Munich. Also in Upper Swabia, and on the southern slopes of the Harz mountains. Fl. July, August.

4. Dianthus inodorus. 5. Dianthus glacialis.

Dianthus alpinus *L. Alpen-Nelke* (Pink). Plate 8, Fig. 3.—The perennial root-stock bears one or more stems 4-8 cm. high. Leaves linear-lanceolate, grass-green. The 2 inner bracts of the outer calyx (epicalyx) ovate, longly acuminate, their point shorter than the calyx-tube, the 2 outer bracts as long as the calyx. Flowers flesh-red above, with a purple ring spotted with white at the throat, greenish underneath, scentless.—Eastern Alpine chain as far as Tyrol, preferably on limestone, at an altitude of 1000-2000 m. Fl. June to August.

Dianthus inodorus *Steudel. Wald-Nelke* (Wood-Pink). Plate 8, Fig. 4.—The leaves of the perennial root-stock form a close tuft, from which arise one or several flowering stems, 3-10 cm. or more high, and bearing one or more flowers. Leaves narrow-linear, shortly acuminate, finely serrate at the edge, grass- or bluish-green. The two upper bracts of the outer calyx are subrotundate-ovate, only a quarter as long as the calyx. Petals unequally inciso-dentate, almost twice as long as the calyx, not bearded at the throat; rose-red to purple-red, with darker veins.—On rocky, dry slopes, distributed over the entire Alpine chain to an altitude of 2000 m., but scattered; also in South Europe. Fl. July, August.

Dianthus glacialis *Hänke.* (D. alpinus *L.*) Plate 8, Fig. 5.—The prostrate perennial root-stock bears a loose rosette of leaves, from which spring a few 1-flowered stems, only 5-10 cm. high. Leaves lanceolate-linear, narrowed from the middle, rough at the margin. Stems bearing 1-2 pairs of narrower leaves. Calyx-scales with a stiff awn and longer than the calyx-tube. Petals rose-

red, spreading, truncate, and with pointed teeth .— This Pink, which, according to Schlechtendal, is only a high Alpine form of the taller and more slender *D. alpinus L.* (which is distributed over the entire Alpine chain), occurs in the highest granite Alps, near glaciers, at an altitude of 1900-2000 m. above sea-level throughout Grisons, Glarus, Tyrol, Salzburg, Carinthia and Styria. Fl. July, August.

Of other Pinks which occur in the Alps we may mention also :—

Dianthus barbatus *L.* Stem 15 - 45 cm. high. Leaves amplexicaul below, *broadly lanceolate ;* calyx-scales herbaceous. *Flowers in fascicles.* Petals large, purple-red to white.—Southern Alpine chain as far as Carniola.

Dianthus Carthusianorum *L.* Stem 15-40 cm. high. Flowers a flaming purple-red, 5-6 together, forming a terminal head. Calyx-scales brown, scarious.—Usually abundant in Germany on grassy hills, also in the Alps, on mountain-meadows to an altitude of 2000 m. above sea-level.

Saponaria ocymoides *L.* *Liegendes Seifenkraut* (Soapwort). Plate 9, Fig. 1.—From the woody root-stock sprout several erect stems, 8-20 cm. high, branched above, somewhat rough with hairs. Lowest leaves obovate, upper ones more lanceolate ; calyx clothed with close-set glandular hairs tinged with reddish-brown. Petals obovate, bearded at the throat, flesh-coloured or light purple-red.—Subalps of South-East Switzerland, Carinthia and South Tyrol. Fl. from May to August.

Saponaria Pumilio *Boissier. Zwerg-Leimkraut* (Catch-fly). Plate 9, Fig. 2.—A low, perennial Alpine plant, forming a thick tuft, with linear, grass-green leaves. Flower-stalk often scarcely higher than the leaves, bearing one flower. Calyx oblong, inflated and bell-shaped, many-ribbed, net-veined, rough-haired. Flowers large, purple-red.—On damp rocks of the granite Alps ; Tyrol, Salzburg, Styria, Carinthia, at an altitude of 1900-2700 m. above sea-level. Fl. June, July.

Silene rupestris *L.* Plate 9, Fig. 3.—A much and loosely branched herb, 6-15 cm. high, with erect, glabrous stems, furcately branched above. Leaves oblong-lanceolate. The white or somewhat reddish flowers, borne on hair-like stalks, form loose corymbs. Petals spatulate, deeply emarginate, almost twice as long as the calyx.—In dry, rocky places, distributed over the Alpine chain to an altitude of 2000 m. ; occurs also in the Vosges and the southern parts of the Black Forest. Fl. July, August.

Silene saxifraga *L.* Plate 9, Fig. 4.—From the creeping, tuft-forming root-stock arise several erect, glabrous stems, 8-15 cm. high, which bear 4-6 pairs of narrow, lanceolate, glandular, pointed leaflets. The flowers are borne on long, hair-like stalks, mostly single, seldom two together. Calyx clavate, 10-striate, with ovate, blunt teeth. Petals deeply 2-fid, white to rose-red, reddish or greenish below.—On stony mountain-slopes of the Alps and Subalps : Southern Switzerland, South Tyrol, Styria, Carinthia, Carniola, to an altitude of 2000 m. above sea-level. Fl. July, August.

Silene acaulis *L.* (Moss-Campion.) Plate 9, Fig. 5. —Above the woody tap-root, which penetrates deep into the earth, the root-stock divides up into numerous branches, closely pressed together, which are clothed below with dead leaves, and above bear a rosette of bright green leaves; and thus a thick tuft is formed. Out of each rosette arises an elegant, light purple-red flower, on a slender stem of about 2 cm. high. The variegated cushion formed in this manner has a most charming appearance.—Distributed over the far North and the entire Alpine chain, ascending to the snow-line, but also here and there in the Subalps, particularly on mountain-tops and on damp rocks. Fl. June, August.

Viscaria alpina *Don. Alpen-Lichtnelke* (Alpine Campion). Plate 9, Fig. 6.—Stem 8-15. cm. high, neither sticky nor hairy, bearing 1-3 pairs of leaves. The root-stock ends in a fusiform tap-root and throws up a thick tuft of leaf-rosettes, some of which remain sterile, *i.e.*, bear no flowering stems. Leaves sessile, linear-lanceolate. The flowers, of a peach-bloom red, or often paler, form at the top of the stem a close, capitate umbel.—This Campion, which is also widely distributed in the far North, is found on the highest granite and limestone Alps in the neighbourhood of the snow-line, to an altitude of 3000 m. above sea-level; Valtellina, Wallis, Tyrol, Grisons and Carinthia. Fl. July, August.

IX. Family: Alsinaceæ.

Alsine verna *Bartling.* (Arenaria verna *L.*) *Frühlings-Miere.* Plate 10, Fig. 1.—Elegant little plant, the

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short perennial root-stock of which forms a close tuft, covered at the base with dead leaves. Flower-stalks erect, sometimes prostrate, 4-8 cm. high, branched, many-flowered. Leaves linear-subulate, stiff. Sepals ovate-lanceolate, 3-nerved, membranaceous at the edge. Flowers in loose, forked panicles. Petals white, obovate, with a short claw, somewhat larger than the sepals.—In stony, grassy places, distributed over most European countries; over the entire Alpine chain, to an altitude of 2300 m.; also scattered in Germany (Harz Mountains, Thuringia, Aix-la-Chapelle, etc.). Fl. June to August.

Alsine laricifolia *Wahlenberg.* (Arenaria laricifolia *L.*) Plate 10, Fig. 2.—The procumbent stems, woody at the base and branched, form a loose tuft. The branches, which rise to a height of 20 cm., are furcately divided, 1- to many-flowered, and like the leaf-stalks and calyx, are shortly hairy. Leaves narrow-linear, very finely serrate at the margin, pubescent. In the leaf-axils are small fascicles of leaves. Sepals 3-nerved, looking as if singed at the point. The white petals obovate, semi-pellucidly veined.—On dry slopes and in pastures of the higher Alps, at an altitude of 1700-2100 m.; West and South Switzerland, Tyrol, Styria, Carniola, Austria. Fl. July, August.

Cherleria sedoides *L.* (Alsine Cherleri *Fenzl.*) *Moosartige Cherlerie* (Cyphel). Plate 10, Fig. 3.—Small, perennial Alpine plant, forming tufted, moss-like cushions. Roots penetrating deeply, branches very short, covered with close, adpressed, linear, stiff leaves. In the minute yellow-green flowers are to be seen, as a rule, only

the 5 light-green sepals, while the petals themselves are generally absent.—On the higher Alps of Switzerland and the entire Alpine chain, particularly on limestone, widely distributed to an altitude of 3000 m. The cushions occur particularly on moist rocks and wedged into crevices of rock, and are easily mistaken by the untrained eye for cushions of moss. Fl. July, August.

Moehringia muscosa *L.* (Arenaria muscosa *L.*) Plate 10, Fig. 4.—Stem slender, 10-20 cm. long, forming loose, moss-like tufts. Leaves almost filamentous, somewhat fleshy, nerveless, bright green. The small flowers are borne on thin stalks, 2 cm. long ; they have 4 green sepals and 4 somewhat longer, white petals.—On damp, shady rocks, distributed throughout the entire Alpine chain, particularly on limestone, to an altitude of 2000 m. The moss-like plant often hangs down out of damp rock-crannies. Fl. June to September.

Arenaria bifloria *L.* (Sandwort.) Plate 10, Fig. 5.—The whole plant recalls in its appearance the common Thyme. Stem elongate, prostrate, with few erect branches, 5-15 cm. high, bearing leaves fairly close together. Leaves small, obovate, almost round, sometimes with a small terminal point. Branches axillary ; sepals glabrous, distinctly 1-nerved, shorter than the white petals.—On damp rocks and sandy banks of streams in the higher Alps, to an altitude of 3200 m. Switzerland, Salzburg, Tyrol, Styria, Carinthia. Fl. July, August.

Arenaria grandiflora *Allioni.* Plate 10, Fig. 6.—From the perennial root-stock are produced prostrate stems, from which arise several 1-3-flowered branches,

1. Alsine verna. 2. Alsine laricifolia. 3. Cherleria sedoides.
4. Mochringia muscosa. 5. Arenaria biflora. 6. Arenaria grandiflora.

ascending to a height of 20 cm. Leaves narrow, lanceolate, sharply aristate, somewhat thickened at the margin; they are set somewhat closely together, especially at the lower part of the stem; flower-stalks and sepals with glandular hairs. Petals white, rounded at the top, twice as long as the calyx.—In rocky pastures at an altitude of 1200-2000 m. Western Switzerland, Tyrol, to Austria and Carniola. Fl. from May to July.

Arenaria ciliata *L.* Plate 11, Fig. 1.—This plant (like *Arenaria biflora L.*) recalls in its growth the Common Thyme, in that the root-stock throws out several or many stems, which at first are more or less prostrate, but become erect at the tip. Flowering branches 4-10 cm. high, pubescent. Leaves small, ovate, the margin ciliate at the base. Flowers terminal, single, or forming small groups. The white petals somewhat longer than the green sepals.—Distributed over the entire Alpine chain in rocky pastures to an altitude of 2700 m.; frequent. Fl. July, August.

Cerastium latifolium *L. Breitblätteriges Hornkraut* (Mouse-ear Chickweed). Plate 11, Fig. 2.—Prostrate primary stem with caespitose, erect, 1-3-flowered stems, 5-12 cm. high. Leaves oblong, broadly lanceolate, covered with woolly hairs, bluish-green, the lowest leaves only with short stalks. Flower-stalks cernuous after flowering. Sepals with membranaceous margin. Petals twice as long as the calyx, obcordate, white. On limestone and primary rock.—Distributed over the entire Alpine chain to an altitude of 2800 m., on dry slopes; frequent, as a rule. Fl. July, August.

Cerastium alpinum *L.* Plate 11, Fig. 3.—Stem creeping, with several erect branches, which have rosettes of leaves at the base. The whole plant blue-green, generally covered with long, woolly hairs. Flowering stems erect, 5-10 cm. high, with 1-5 flowers on long stalks. Petals conspicuously large, white, almost twice as long as the sepals.—In damp, rocky places. Distributed over the entire Alpine chain to an altitude of 2000 m., and descending with the rivers to the lowlands; also on high moors in the Arctic regions. Fl. July, August.

X. Family: Linaceæ.

Linum alpinum *Jacquin. Alpen-Lein* (Alpine Flax). Plate 11, Fig. 4.—In the higher regions only 7-15 cm. high and with small flowers, at lower levels 25-40 cm. high and with larger flowers. The short, stout root-stock bears a number of both barren and flowering stems, which form a loose tuft below; the flowering stems are erect, and bear glabrous, linear-lanceolate, spirally-arranged leaves, and end in a many-flowered corymb. The 5 sky-blue petals, which are more than once as long again as the glabrous, membranaceously-bordered sepals, are contiguous for only half their length and then separate, while in the similar *Linum perenne L.*, which occurs here and there in South Germany, they are entirely imbricate along the margin.—On the Alps and Subalps of the Eastern Alpine chain (Austria, Styria) at an altitude of 1500-2000 m. Fl. June, July.

4. Linum alpinum. 5. Hypericum Coris.

XI. Family: Hypericaceæ.

Hypericum Coris *L.* *Quirlblätteriges Johanniskraut* (St. John's Wort). Plate 11, Fig. 5.—The woody tap-root bears several simple, erect branches, 15-50 cm. high. The leaves are somewhat crowded in 4-foliate whorls, are linear, almost acicular, with revolute margin, and with transparent spots. The yellow flowers in a terminal, verticillately-branched panicle. Sepals oblong, with glandular cilia.—On rocks of Central Switzerland and in South Tyrol, to an altitude of 1600 m.; scattered. Fl. July, August.

Hypericum Richeri *Villars.* The usually simple stem is erect, 15-30 cm. high, terete below, above with two longitudinal ribs. The opposite pairs of leaves are near together and partially imbricate. Leaves coriaceous, oblong-rotundate with bluntly-elongate point; they are closely black-punctate at the margin, without transparent dots. Sepals ovate, with pronounced black dots, ciliate with bristles at the margin. The conspicuous flowers are yellow with fine black dots, and form a few-flowered terminal raceme.—Pyrenees, Jura, near Zermatt and on the Schneeberg (Carniola); scattered and usually rare, at an altitude of 1500-1800 m., in dry pastures. Fl. July, August.

XII. Family: Geraniaceæ.

Geranium macrorrhizum *L.* *Grosswurzeliger Storchschnabel* (Crane's-bill). Plate 12, Fig. 1.—From the thick woody root-stock arise one or several stems 30-60 cm.

high, furcately branched above. The radical leaves are long-stalked, palmate, 5-7-fid, the stem-leaves 3-fid. Sepals converging into a globe at the time of flowering. Petals spatulate, with a long claw, blood-red.—Southern Alpine chain: Tyrol to Carniola, to an altitude of 1600 m. above sea-level; scattered. Cultivated in Germany as a garden flower, and occurring wild locally as an escape. Fl. June, July.

Geranium argenteum *L.* Low Alpine plant. Leaves radical, 5-7-partite, with deep 3-fid lobes; these are closely covered with silky hairs, greyish-white. Flower-stalks bearing 2 flowers. Flowers conspicuous, 2 cm. broad in diameter, pale-red.—In pastures and on stony slopes of South Tyrol and Carniola, especially on limestone, to an altitude of 2200 m. above sea-level. Fl. July, August.

XIII. Family: Rhamnaceæ.

Mostly low, much-branched shrubs, of which we only mention the following Alpine species: **Rhamnus saxatilis** *L. Felsenkreuzdorn* (Buckthorn): Switzerland, Tyrol, Carniola, Styria.—**Rhamnus alpina** *L.:* in the Subalps of these mountains.

XIV. Family: Papilionaceæ.

Trifolium alpinum *L. Alpen-Klee.* Plate 12, Fig. 2. —Radical leaves somewhat long-stalked, emerging from the sheath-like, elongate stipules; the 3 leaflets lanceolate, somewhat pointed at both ends, very finely serrate at the margin. The peduncle bears a loose globose head

1. Geranium macrorrhizum. 2. Trifolium alpinum. 3. Trifolium rubescens.
4. Trifolium badium. 5. Phaca frigida. 6. Phaca alpina.

of 6-12 red to whitish flowers, which are 2 cm. long, and are borne on small pedicels.—On the Swiss Alps from 1600-2200 m.; frequent; also in South Tyrol. Fl. June to August.

Trifolium pallescens *Schreber.* Plate 12, Fig. 3.—Stem erect, 4-8 cm. high; at its apex a globose head of first white, later yellow flowers, the keels of which at last become usually purple-red. The 3 leaflets of the rather short-stalked leaves are rotundate-obovate, finely denticulate at the margin; stipules ovate-lanceolate, acuminate.—In Alpine meadows at an altitude of 1600-2200 m., from Switzerland to Salzburg and Carniola. Fl. July to September.

Trifolium badium *Schreber.* Plate 12, Fig. 4.—Stem erect, 8-15 cm. high. Lower leaves long-stalked, the 3 leaflets bluntly ovate, finely serrate at the margin. Flower-heads at first globose, golden-yellow, later ovate and glossy leather-brown; lower pedicels deflexed.—Distributed over the entire Alpine chain on mountain-meadows at an altitude of 1300-2300 m.; frequent, especially on limestone. Fl. July, August.

Phaca frigida *L. Berglinse.* Plate 12, Fig. 5.—Stem simple, 15-30 cm. high. Leaves mostly having only 4-5 pairs. Leaflets ovate, somewhat acuminate above and below, hairy beneath and on the margin. Stipules ovate, amplexicaul. The yellowish-white flowers form a loose, short raceme.—Distributed over the entire Alpine chain, in mountain-meadows, at an altitude of 1700-2000 m., especially on primary rock; frequent, as a rule. Fl. July, August.

Phaca alpina *L.* Plate 12, Fig. 6.—Stem 15-50 cm. high, erect, branched, with soft hairs. Leaves with 9-12 pairs of linear-lanceolate leaflets. Flowers yellow.—In Alpine meadows and stony detritus, at an altitude of 1300-1900 m.; in Switzerland (Waadt, Wallis, Grisons, Glarus), Upper Bavaria, Salzburg, Tyrol, and Carinthia. Fl. July, August.

Oxytropis campestris *De Candolle.* (Astragalus campestris *L.*) *Alpen-Fahnenwicke.* Plate 13, Fig. 1.—The whole plant is somewhat villose. The root-stock above the long fusiform tap-root is covered with old stipules and leaf-stalks. Leaves pinnate; the 21-31 leaflets are oblong rotundate, with silky hairs beneath. The common petiole is 4-6 cm. high; the common flower-stalk is higher, sometimes 20 cm., and bears a spike of numerous pale yellow flowers, tinged with red. In the variety *O. caerulea* Koch the flowers are blue, and the standard has in the middle a greenish-yellow spot, streaked with blue; in the var. *O. sordida* Koch the flowers are dirty pale yellow, the standard has a green and violet streak up to the middle, and the keel has on both sides a blackish-violet spot.—In mountain-pastures and on rocks of the Polar regions; also along the entire Alpine chain, from Switzerland to Carinthia, at an altitude of 1300-2400 m.; the blue variety preferably on primary rock in the Salzburg Alps.

Oxytropis montana *De Candolle.* (Astragalus montanus *L.*, Oxytropis Jacquini *Bunge.*) Plate 13, Fig. 2.—The peduncle, which is red above, is 5-8 cm. high. The pinnate leaves, usually only 5 cm. long, bear generally 12-16 pairs of oblong-ovate, pointed leaflets, which become

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gradually smaller towards the tip of the common petiole. The flower-raceme, which is sometimes short and dense, sometimes longer, consists of 6-12 red-violet or lilac-red flowers, hardly 1 cm. long, the standard of which is $1\frac{1}{2}$ times as long as the keel. The calyx is clothed with blackish-red hairs and ends in 5 blackish-purple, short teeth.—In Alpine pastures of the entire Alpine chain to an altitude of 2200 m.; as a rule frequent, especially on limestone. Fl. July, August.

Astragalus australis *Lam.* (Phaca australis *L.*) *Berglinse* (Milk-vetch). Plate 13, Fig. 3.—The thin, creeping root-stock gives rise to several divergent ascending stems, which are often only 3 cm. high, but sometimes attain a height of 30 cm. The common leaf-stalks are 4-5 cm. long, and bear 4-5 pairs of ovate-oblong or lanceolate leaves, having fine hairs on the lower surface. The long flower-stalks bear at their apex a spike, which is at first globose, later 2-4 cm. long, the separate flowers being 1 cm. long, at first erect, later more horizontal; they are white, sometimes with a greenish or reddish tinge, the apex of the keel violet. Wings emarginate or 2-fid, longer than the keel.—Distributed over the entire Alpine chain in pastures and on stony places at an altitude of 1700-2200 m. above sea-level. As a rule frequent. Fl. July, August.

Astragalus alpinus *L.* (Phaca alpina *Jacquin.*) *Alpen-Berglinse.* Plate 13, Fig. 4.—Stem ascending or upright, 15-50 cm. high, with adpressed hairs. Leaves with 7-12 pairs of linear or oval-oblong leaflets, which have adpressed hairs on both surfaces. The long flower-stalk bears a loose, sometimes globose, sometimes elongate spike;

standard blue, the blunt entire wings white, keel violet at the tip.—In pastures, on detritus and rocks, distributed over the entire Alpine chain, especially on primary rock at an altitude of 1600-2200 m. above sea-level. Fl. July, August.

Hedysarum obscurum *L.* *Dunkler Süssklee.* Plate 13, Fig. 5.—The perennial root-stock gives rise to one or several erect stems, from 6-30 cm. high. The short-stalked leaves bear 11-19 ovate-oblong leaflets. Stipules connate into a single, 2-fid leaflet opposite the leaf. The handsome, purple-red flowers form a conspicuous, elongate raceme. —Distributed over the entire Alpine chain, particularly by streams and in damp meadows and pastures, at an altitude of 1600-2200 m.; also in the Silesian-Moravian range, and locally in the Riesengebirge. Fl. July, August.

XV. Family: Rosaceæ.

Dryas octopetala *L.* *Silberwurz.* Plate 13, Fig. 6. —Stem short, longly procumbent, forming together with the leaves a close tuft. Leaves oblong-rotundate, deeply crenate, glossy-green above, white and felty below. Flower-stalk erect, 4-6 cm. high. Flowers white, resembling those of many anemones. The sepals are considerably shorter than the 8 petals. The aristate fruits form, after flowering, delicate feathery crests, similar to those of many anemones.—Distributed over the Polar regions and the entire Alpine chain; frequent, especially on limestone, at an altitude of 1300-2200 m. above sea-level; also descends with the rivers into the Bavarian table-land drained by the Isar. Fl. May to August.

Geum montanum *L.* *Nelkenwurz* (Avens). Plate 14, Fig. 1.—The whole plant villose, generally 15-30 cm., on high Alps often only 8-10 cm. high. Root-stock short, without stolons; leaves lyrate, pinnatifid; the terminal leaflet very large, almost cordate, bluntly lobed, the lateral leaflets much smaller, ovate, unequally crenate. The flower-stalks bear one, seldom two, large, shining-yellow, widely open flowers 2-3 cm. broad. — Widely distributed over the entire Alpine chain from the Subalps to an altitude of 2300 m., in meadows and pastures; frequent; also on the ridges of the Riesengebirge. Fl. June to September.

Geum reptans *L.* Plate 14, Fig. 2.—Resembling the last species, but the root-stock gives rise to long, creeping, leafy stolons. The radical leaves interruptedly pinnate, becoming broader towards the upper end. Leaflets inciso-serrate, with pointed serrations, mostly 3-fid, the large terminal one 3-5-fid. The flower-stalks, which are 10-15 cm. long, slightly overtop the leaves. The beautiful golden-yellow flowers are $2\frac{1}{2}$-5 cm. broad, widely opened, and have 5-8 almost circular petals.—On the highest Alps to an altitude of 2500 m., on rocks and stony detritus; in Switzerland, Tyrol, Salzburg, Styria, Carinthia; scattered, usually rare. Fl. July, August.

Potentilla nitida *L.* *Fingerkraut, Seidenröschen* (Cinquefoil). Plate 14, Fig. 3.—Low Alpine plant, forming tufts, with several flower-stems 5-8 cm. high. Leaves short-stalked, 3-foliolate; the leaflets are oblong, 3-toothed at the end, on both surfaces glistening with adpressed silvery hairs. The stems, which are tomentose above and at the most are 8 cm. high, each bear only one rose-red

(very seldom white) flower which is comparatively large, 2-3 cm. in diameter.—In rock-crannies of the Southern Alpine chain of Tyrol, Styria, Carinthia and Carniola, at an altitude of 2000-3000 m.; especially on limestone; scattered. Fl. July, August.

Potentilla Clusiana *Jacquin.* Plate 14, Fig. 4.—Stem 2-8 cm. high, with spreading hairs. Radical leaves long-stalked, 5-digitate. The leaflets cuneate to lanceolate, 3-toothed at the tip, glabrous above, villose below, ciliate at the margin, with silky hairs. The flower-stalks bear at their apex mostly 3 flowers, the 10 sepals of which are villose; the 5 petals are *white*, obovate, slightly emarginate at the tip.—Distributed over the Eastern Alpine region; Upper Bavaria, Tyrol, Salzburg, Styria and Lower Austria, at an altitude of 1600-2000 m., growing especially in the crevices of the limestone rocks. Fl. July, August.

Potentilla grandiflora *L.* Plate 14, Fig. 5.—Stem prostrate or ascending, 10-30 cm. high, both stem and leaf-stalks villose, with short spreading hairs. Radical leaves long-stalked, 3-foliolate, leaflets obovate, deeply serrate, pubescent above, villose beneath. The flower-stalk is forked above into two flowering branches of almost equal length, at the apex of each of which stand 2-4 flowers. The flowers have a villose calyx and 5 yellow petals.—Switzerland, Tyrol, Salzburg, Carinthia, in Alpine pastures, to an altitude exceeding 1600 m. above sea-level. Scattered and sparse. Fl. July, August.

Potentilla frigida *Villars.* Plate 14, Fig. 6.—Resembling the last species, but much denser, very villose,

1. Geum montanum. 2. Geum reptans. 3. Potentilla sulda.
4. Potentilla Clusiana. 5. Potentilla grandiflora. 6. Potentilla frigida.

whence the plant has a grey-green appearance. The flower-stalks, which are 3-7 cm. high, bear generally only *one* flower each. Leaves 3-foliolate, the leaflets obovate, bluntly toothed; flowers yellow, of irregular size, sometimes equalling those of *P. grandiflora*.—On the highest Alps to an altitude of 2500 m. in Switzerland, Tyrol, Styria, and the Salzburg Alps, preferably on primary rock. Fl. July, August.

Rosa alpina *L.* *Felsen-Rose* (Alpine Rose). Plate 15, Fig. 1.—Weak shrub of 1-2 m. high; the older branches without spines and prickles; on young shoots there are often numerous prickles and single curved spines. The common leaf-stalk bears mostly 7, but sometimes 9 or 11, oblong-elliptical, doubly serrate leaflets. At the base of the leaf-stalk are broad, longly acuminate stipules. Flower rose-red, fragrant; its 5 petals are conspicuously large, emarginate at the tip, almost 2-lobed. Segments of the calyx with a lanceolate point, longer than the corolla.—Distributed over the entire Alpine chain to an altitude of 1800 m.; frequent; also in various mountain-woods of Germany, the Riesengebirge, Erzgebirge, Vosges and Baden Black Forest. Fl. May, June, July.

XVI. Family: Pomaceæ.

Aronia rotundifolia *Persoon.* (Amelanchier vulgaris *Mnch.*) *Felsen-Mispel, Felsenbirne.* Plate 15, Fig. 2.—Tree-like shrub, 1-2 or even as much as 6 m. high. Leaves bluntly ovate, serrate at the margin, felty with hairs beneath. Flowers racemose at the ends of the branches, appearing contemporaneously with the leaves. Petals

narrow, oblong, rounded at the tip, white. Fruit small, globose, black.—Distributed over the entire Alpine chain. to an altitude of 1700 m. above sea-level, preferably on limestone rocks and detritus. Also on the central mountains of South Germany, the Rhine Province and Thuringia, Fl. from April to June.

XVII. Family : Onagraceæ.

Epilobium rosmarinifolium *Hänke. Weidenröschen* (Willowherb). Plate 15, Fig. 3.—Resembling *E. angustifolium L.*, which is common throughout Middle Europe, but of lower growth, more branched, and distinguished by its narrower, linear, veinless leaves, in the axils of which small leaf-fascicles sometimes arise. Flower-raceme short ; pistil as long as the longer stamens. Petals purple-red to rose-red.—In gravelly places, on loose, stony slopes, and at the margin of the rivers and streams of the Alps and Subalps ; descending thence into the valleys, on the banks of the Rhine in Alsace and in Southern Baden, also in Würtemberg (mouth of the Argen) ; locally very abundant. Fl. July, August.

XVIII. Family : Portulacaceæ.

Montia minor *Gmelin. Kleines Quellenkraut.*—Small, glabrous, bright green, somewhat fleshy herb, 3-10 cm. high, forming small tufts. Leaves obovate. The small reddish-white flowers arise singly, or 2-3 together, in the axils of the upper leaves.—By springs and in wet places, distributed over the Alpine chain ; frequent. Fl. May, June.

1. Rosa alpina. 2. Aronia rotundifolia. 3. Epilobium rosm
4. Herniaria alpina. 5. Sedum roseum. 6. Sedum a

XIX. Family : Paronychiaceæ.

Herniaria alpina *L.* *Alpen-Bruchkraut* (Rupture-wort). Plate 15, Fig. 4.—Stem much branched, procumbent, only about 10 cm. long, with closely-set, oblong-rotundate, ciliate leaves. The small pale-green flowers singly, or few together, in axillary clusters.—Switzerland : Wallis, Grisons, Tyrol. In sandy places, particularly on primary rock, to an altitude of 2500 m. ; scattered. Fl. July, August.

XX. Family : Crassulaceæ.

Sedum roseum *Scopoli.* *Rosenwurz* (Rose-root). Plate 15, Fig. 5.—The tuberous root-stock gives rise to several erect leafy stems, 10-15 cm. high, at the apex of which is developed the dense corymb of numerous flowers. Leaves alternate, oblong-rotundate, serrate at the tip. Flowers reddish-yellow or reddish-purple.—In rocky places, distributed over the greater part of the Alpine chain ; locally also in the Vosges and in the Riesengebirge. Fl. June, July.

Sedum annuum *L.* *Einjähriges Fettblatt* (Stonecrop). Plate 15, Fig. 6.—The entire plant 10-12 cm. high, branched from the base upwards into several vertically ascending, loosely-foliate stems ; these are mostly forked, finally elongated, here and there flexuose. Leaves fleshy, 2-4 mm. long, blunt, semi-circular in section. Flowers yellow, in a spiked raceme.—On rocks, especially schist and primary rock, distributed over the entire Alpine chain and the Subalps to an altitude of 2000 m. above sea-level ; also in the Vosges and the Baden Black Forest. Fl. June to August.

Sempervivum arachnoideum *L. Spinngeweb-Hauswurz* (House-leek). Plate 16, Fig. 1.—The radical rosettes consist of obovate, shortly pointed, fleshy leaves; at the points arise radiately-spreading fascicles of hairs, which become woven into a web-like texture with the hairs of the neighbouring leaves. The erect stem grows to 5-12 cm., is well provided with leaves, and generally ends in a 3-forked corymb. The petals are purple-red to rose-red, elongate-lanceolate, and three times as long as the green segments of the calyx.—This pleasing house-leek occurs frequently on rocks in the higher Alps, throughout Switzerland, Tyrol, Salzburg, Styria and Carinthia, at an altitude of 1300 - 2000 m. above · sea - level. Fl. July, August.

Sempervivum Wulfeni *Hoppe.* Plate 16, Fig. 2.—Very nearly related to the Common House-leek (*S. tectorum L.*), which has been introduced everywhere in Middle Europe as an ornament of walls and roofs, but is chiefly distinguished by the yellow or greenish colour of the linear, acuminate petals. The succulent leaves of the rosettes are obovate, suddenly terminating in a spinous point, blue-green. The thick stem, 12-15 cm. high, is clothed with elongate, ciliate leaves, and is branched at the end into a corymb, with rather numerous flowers. Calyx semi-globose, composed of 12-20 linear sepals.—On primary rock. Distributed over the Alpine chain of Switzerland to Styria, but scattered, at an altitude of 2000-2600 m. Fl. June to August.

Sempervivum montanum *L.* Plate 16, Fig. 3.—Leaves of the rosettes oblong-cuneate, clothed on both sides

1. Sempervivum arachnoideum. 2. Sempervivum Wulfeni. 3. Sempervivum montanum. 4. Saxifraga rotundifolia. 5. Saxifraga stellaris. 6. Saxifraga Seguieri. 7. Saxifraga androsaceae.

with pubescent, glandular hairs, ciliate at the margin. The stem-leaves are oblong and have purple-red tips. Stem 4-12 cm. high, ending above in the inflorescence, which is often divided 2-3 times. The star-like, spreading petals are pale red, with a violet central stripe.—On primary rock. Distributed over the entire Alpine chain, in dry places, to an altitude of 2000 m. Fl. July, August.

XXI. Family: Grossulariaceæ.

Ribes petraeum *Wulfen. Felsen-Johannisbeere* (Currant).—A shrub of 1-1¼ m. high, resembling the red-currant bush of gardens, the leaves are acute, the calyx more campanulate, ciliate at the margin. Flowers green, closely sprinkled with red dots.—On damp mountain-slopes; scattered over the Alpine chain of Switzerland to Styria; also in the Riesengebirge, the Vosges, and the Baden Black Forest locally. Fl. April, May.

XXII. Family: Saxifragaceæ.

Saxifraga rotundifolia *L. Rundblätteriger Steinbrech* (Saxifrage). Plate 16, Fig. 4.—15-60 cm. high. The radical leaves have stalks 7-15 cm. long, are sub-rotundate-cordate, coarsely toothed. Stem erect, softly hairy, paniculately branched above, with many flowers. Petals spreading like a star, white, with yellow dots at the base and red dots towards the tip.—In damp, shady places, on banks of streams, and in woody ravines of the Alps and Subalps, to an altitude of 2000 m. Fl. June to August.

Saxifraga stellaris *L.* Plate 16, Fig. 5.—The radical leaves form fascicles or rosettes; they are narrowed towards the base, oblong-ovate, coarsely toothed towards the point, sparsely hairy on both sides and at the margin. Stem erect, 6-15 cm. high, branched into a loose, terminal raceme. Flowers 2-3, less frequently 8-10; small white petals with two yellow spots at the base; flower-stalks slender. Segments of the calyx recurved soon after flowering.—In damp places and by springs in the entire Alpine region; also in the Vosges and the Black Forest. Fl. May to August.

Saxifraga Seguieri *Sprengel.* Plate 16, Fig. 6.—The spatulate, entire leaves are pubescently hairy and form loose tufts. Flowering stems only 1-4 cm. high, mostly with one flower, seldom with more. Petals oblong-linear, yellow, as long as the sepals.—On the highest Alps of Switzerland and Tyrol, to an altitude of 3200 m.; scattered. Fl. July, August, September.

Saxifraga androsacea *L.* Plate 16, Fig. 7.—The entire plant villose. Stem but little over 5 cm. high. Radical leaves crowded into a rosette, entire or with 3 teeth at the tip. Petals white or greenish, twice as long as the short, oblong-rotundate segments of the calyx. —In damp, rocky places. Distributed over the entire Alpine chain, frequent, to an altitude of 3200 m. Fl. June, July.

Saxifraga aizoides *L.* Plate 17, Fig. 1.—From the short, sometimes tuft-forming root-stock arise several flowering branches 10-15 cm. high. Leaves alternate, lanceolate or linear, narrow, somewhat thickened, glab-

rous and glossy, with distant cilia at the margin. At the summit of the stem stands the irregular, loose umbel, usually bearing 4-8 flowers. Petals lemon-yellow, with saffron-yellow spots, or pure saffron-yellow, scarcely longer than the calyx-segments, which are of the same colour, or green. In the centre of the flower a fleshy, annular disc.—On wet, rocky detritus, especially at the foot of a glacier, and at the edge of streams and waterfalls. Distributed over the entire Alpine chain to an altitude of 2000 m.; frequent. Also descending with the rivers to the outskirts of the Alps (Munich, Augsburg, etc.), and indigenous in Arctic regions. Fl. June to August.

Saxifraga bryoides *L.* Plate 17, Fig. 2.—The glabrous, glossy leaves with their thorny points form at the base a close, almost globose tuft. Stem slender, 1-flowered, only 3-8 cm. high, with narrow, adpressed leaves. Petals rather large, white or yellowish, twice as long as the green sepals.—In dry, rocky places of the highest Alps, to an altitude of 2500 m. above sea-level, especially on primary rock. Distributed over the entire Alpine chain; otherwise only in the small Schneegrube of the Riesengebirge. Fl. July, August.

Saxifraga caesia *L.* Plate 17, Fig. 3.—Stem-leaves forming a tuft, oblong-linear, arcuately recurved from the base, blue-green. Flower-stems 2-8 cm. high, bearing 2-6 flowers. Petals obcordate, 4-5 mm. long, white or yellowish, about twice as long as the ovate calyx-segments. —Switzerland to Austria and Styria, from the Subalps to an altitude of 2700 m. above sea-level, in dry places. Fl. June, July.

Saxifraga Aizoon *Jacquin.* Plate 17, Fig. 4.—The root-stock forms several short branches, which bear close rosettes of large, fleshy leaves; these are ligulate, with cartilaginous serrations. Flower-stalk erect, generally 10-15 cm. high, more rarely reaching 50 cm., paniculately branched above. Branches 1-3-flowered. Petals white with green nerves, often dotted with red at the base.—Widely distributed over the entire Alpine chain, to an altitude of 2500 m., especially frequent on limestone rocks. Also in the Vosges, Black Forest, on the Swabian Alb, in the Rhine Palatinate, in Silesia, Bohemia and Moravia. Fl. June to August.

Saxifraga Burseriana *L.* Plate 17, Fig. 5.—Stem procumbent, forked, with erect, densely leafy branches. The leaves form dense rosettes, are lanceolate, with stiff points, 4-7 mm. long, glossy grey-green. The flower-stems are thin, reddish, mostly 1-flowered, generally only 2-4 cm. high. Petals flatly expanded, white, with reddish veins. —On limestone rocks of the Alps in Tyrol, Salzburg, Carinthia, Carniola, Styria, at an altitude of 1900-2400 m. above sea-level. Fl. June, July.

Saxifraga oppositifolia *L.* Plate 17, Fig. 6.—This charming Saxifrage forms low, tufted cushions of several centimetres diameter. Branches only 2-3 cm. high, with numerous opposite leaves, which are imbricate in 4 rows and ciliate at the margin. The flowers, one or two together at the ends of the branches, are rose-red, afterwards violet; in their rich abundance they often form a lovely ornament of the rocky landscape.—Distributed over the Northern Alpine chain to Styria and Carniola;

1. Saxifraga aizoides. 2. Saxifraga bryoides. 3. Saxifraga caesia.
4. Saxifraga Aizoon. 5. Saxifraga burseriana. 6. Saxifraga oppositifolia.
7. Saxifraga biflora. 8. Zahlbrucknera paradoxa.

also in the Riesengebirge and in the Arctic regions. Fl. May and June, then again in August.

Saxifraga biflora *Allioni.* Plate 17, Fig. 7.—Much resembling the former, but the tufts are looser, inasmuch as the leaves, though larger, are more distant. At the ends of the branches are produced at least 2 flowers (sometimes 3); the petals are more oblong, are also rose-red, but not fading to a violet tint.—Distributed over the entire Alpine chain, frequent; in rocky places in the neighbourhood of the snow-line to an altitude of 3300 m. above sea-level. Fl. July, August.

Zahlbrucknera paradoxa *Reichenbach.* Plate 17, Fig. 8.—Delicate little plant with procumbent, zig-zag stem, 6-15 cm. long. Leaves alternate, long-stalked, broadly cordate with 5-7 lobes. The few flowers are terminal, long-stalked, small, with 5 green petals.—On damp rocks of mica-schist in Carinthia and Styria, at an altitude of 1000-1800 m. Fl. June, July.

XXIII. Family: Umbelliferæ.

Hacquetia Epipactis *De C.* Plate 18, Fig. 1.—Yellow-green, glabrous plant with radical, long-stalked leaves, which are palmately divided, 3-5-lobed. Leaf-divisions 2-3-lobed at the outer margin with sharp double serrations. Flower-stalk leafless, 8-15 cm. high; flower-umbellule capitate, surrounded by an involucre 3 times the size, composed of 5-6 leaves.—In shady mountain woods of Carniola, Carinthia, Styria, scattered; also in Moravia and Silesia, locally. Fl. April, May.

Astrantia major *L.* *Grosse Sterndolde.* Plate 18, Fig. 2.—Radical leaves large, long-stalked, 5-fid with oblong, trifid, unequally serrate lobes. Stem upright, 30-90 cm. high, with only 1-2 leaves. The main umbel is mostly 4-5-rayed, less often 6-8-rayed. The involucral leaves, 12-20 in number, are lanceolate, rose-red with green mucronate point. The individual florets of the flower-head are small, white, greenish or reddish.—In meadows of the Alps and Subalps widely distributed and frequent; also here and there in shady valleys of mountain-woods in North and South-West Germany. Fl. from June to August.

Astrantia minor *L.*—Resembling the former, but much more slender and only 15-30 cm. high. The radical leaves are divided into 7-9 lobes right down to the leaf-stalk; the individual segments are lanceolate, sharply dentate at the margin, white-green underneath. Umbels with 2-4 rays. Involucral leaflets white, the same length as the white florets of the small globose head.—In meadows and open woods of the higher limestone Alps in Switzerland, Tyrol, Carinthia and Savoy, at an altitude of 1800-2300 m. above sea-level. Fl. July, August.

Eryngium alpinum *L.* *Alpen-Männertreue.* Plate 18, Fig. 3.—An amethyst-blue, more rarely whitish-grey, rigid plant of 30-90 cm. high, with cordate, undivided radical leaves, serrate at the margin. Stem-leaves palmate, 3-5-lobed, ciliately serrate. Involucral leaves multipartite, pinnatifid with prickly, setose teeth, longer than the 1-3 ovate capitulate umbels. Petals of the small individual florets white.—In Southern and Western Swit-

1. Hacquetia Epipactis. 2. Astrantia major. 3. Erysimum alpinum.
4. Bupleurum ranunculoides. 5. Ligusticum Mutellina. 6. Linnaea borealis.

zerland, in Upper Carinthia, Carniola and Savoy, in Alpine pastures, at an altitude of 1500-1900 m. above sea-level; scattered. Fl. July, August.

Bupleurum ranunculoides *L.* *Hahnenfussähnliches Hasenohr* (Hare's-ear). Plate 18, Fig. 4.—Stem 10-30 cm. high, simple or slightly branched. Radical leaves linear-lanceolate with several longitudinal nerves; stem-leaves ovate, longly-acuminate with ovate or cordate base, sessile and amplexicaul. The umbel consists of 5 and more rays. The umbellules are many-flowered with yolk-yellow short-stalked florets; the latter are surrounded by the greenish-yellow or brimstone-yellow involucel of 5-10 leaflets, recalling at the first glance a *Ranunculus* flower. —In pastures and on rocks in Switzerland, Tyrol and Carniola, at an altitude of 1500-2200 m.; scattered. Fl. July, August.

Ligusticum Mutellina *Crantz.* *Alpen-Bärwurz* (Bald-money). Plate 18, Fig. 5.—Stem 6-15 cm., seldom 30-50 cm. high. Leaves doubly pinnatifid. Pinnæ extremely elegant, divided into numerous hair-like, pointed lobes. Umbels 9-15-rayed, flowers reddish.—In meadows and pastures distributed over the entire Alpine chain and the Subalps, frequent; also locally in the Baden Black Forest and the Riesengebirge. Fl. June, July.

XXIV. Family: Caprifoliaceæ.

Linnæa borealis *L.* Plate 18, Fig. 6.—Evergreen, low plant, forming large masses, with opposite leaves, which are subovate and slightly dentate at the apex. Flowering stem bearing at the apex a long, thin flower-stalk, which

finally divides into two special pedicels, each of these bears a white or reddish campanulate flower, which has blood-red stripes inside and is fragrant.—In mossy fir-woods of the Alpine chain from Switzerland to Carinthia. Also scattered in North Germany and in North Europe. Fl. May, June, July.

XXV. Family: Rubiaceæ.

To this Order belong some inconspicuous Alpine species of **Galium** (*Labkraut*, Bedstraw).

XXVI. Family: Valerianaceæ.

Valeriana supina *L. Niedriger Baldrian* (Valerian). Plate 19, Fig. 1.—Stem only 2-8 cm. high, forming small, much-branched, dense tufts. Leaves spatulate, entire or somewhat toothed, ciliate; the upper pair lanceolate, sessile. The rose-red flowers form a capitate corymb.—Distributed over the Alpine chain from East Switzerland to Styria, particularly in damp places of the limestone mountains, to an altitude of 2600 m. above sea-level; scattered. Fl. July, August.

XXVII. Family: Dipsaceæ.

To this Order belong some Alpine species of Scabious (**Scabiosa lucida** *Vill.*, **graminifolia** *L.*, **longifolia** *Koch*).

XXVIII. Family: Compositæ.

Adenostyles alpina *Bluff and Fing. Alpendost.* Plate 19, Fig. 2.—The angular stem is 40-90 cm. high. The large radical leaves are long-stalked, cordate-reniform, dentate-

crenate, glabrous, underneath with pubescent hairs on the nerves only. The flower-heads form a corymb. The tubular florets are bisexual, united in many-flowered heads, light amethyst colour.—Distributed over the entire Alpine chain, especially in damp places and in shady ravines, to an altitude of 1600 m. Fl. July, August.

Homogyne alpina *Cassini. Gemeiner Alpenlattich.* Plate 19, Fig. 3.—Root-stock creeping. Stem 15-30 cm. high. Radical leaves long-stalked, cordate-reniform, ligulate-crenate, glabrous, or, underneath only, bearing pubescent hairs on the nerves. Involucre of the flower-head purple-red; florets yellowish.—Distributed over the entire Alpine chain and Subalps, in woods and mountain meadows in damp places, frequent; also in the Jura, Black Forest, Riesengebirge, Erzgebirge and in the Fichtelgebirge. Fl. from May to July.

Aster alpinus *L. Alpen-Aster.* Plate 19, Fig. 4.—Stem 10-15 cm. high, 1-headed. Leaves 3-nerved, softly hairy, entire; the lower ones, which are crowded into a rosette, are spatulate, the stem-leaves oblong, lanceolate. The beautiful flower-head, 4-5 cm. broad, has a golden-yellow centre, surrounded by numerous violet ray-florets. —Distributed over the entire Alpine chain, to an altitude of 1900 m., frequent; also in the Vosges and Pyrenees, and confined to certain localities in the Riesengebirge, Harz, Black Forest and Thuringia. Fl. in May and from July to September.

Bellidiastrum Michelii *Cassini. Alpen-Massliebchen* (Alpine Daisy). Plate 19, Fig. 5.—Leaves radical,

stalked, oblong-spatulate, coarsely toothed. Stem 10-25 cm. high, with a capitulum at the apex, which resembles a large daisy, but is larger, namely, 2-3½ cm. broad. Centre (disc-florets) yellow, ray-florets white, often reddish underneath.—Distributed over the entire Alpine chain and Subalps, and especially frequent in damp rocky places of the limestone mountains. Also in Baden (Hegau, Feldberg, etc.) and in Würtemberg (in the Danube district and on the Swabian Alb). Fl. May to July.

Erigeron alpinus *L. Alpen-Berufskraut* (Flea-bane). Plate 19, Fig. 6.—Radical leaves oblong-rotundate to lanceolate, *roughly hairy;* stem-leaves smaller, lanceolate. Capitula usually solitary on each stem, which is 5-20 cm. high, rarely 2-3 together in a loose corymb. The numerous tubular disc-florets are yellowish, and the outer ray-florets purple-violet, more rarely white.—Distributed over the entire Alpine chain, at an altitude of 1200-1800 m., frequent in stony Alpine meadows. Also in the far North to the Arctic Circle. Fl. July, August.

Erigeron uniflorus *L.* Plate 19, Fig. 7.—Resembling the previous species, but the erect, roughly hairy stem, which is 2-7 cm. high, bears never more than 1 head; the involucral leaves are closely covered with woolly hairs. The crowded radical leaves form close tufts, above the rosettes of which the capitulum often rises but slightly. Disc-florets yellow, ray-florets lilac to whitish.—In grassy places of the higher Alps, to an altitude of 2500 m., on primary rock; from Switzerland to Salzburg, Algau, Tyrol and Carinthia. Fl. July, August.

Valeriana supina. 2. Adenostyles alpina. 3. Homogyne [illegible] 4. Aster alpinus.
5. Bellidiastrum Michelii. 6. Erigeron alpin[illegible] 7. [illegible] uniflorus.

Leontopodium alpinum *Cassini. Edelweiss.* Plate 20, Fig. 1.—Plant closely covered with felty hair, with 1 or more stems, 2-10 cm., rarely ascending to 20 cm. high. Leaves linear-lanceolate. Heads in crowded umbels at the apex of the stem, surrounded by a stellately expanded whorl of *bracts*, which are closely covered with a white felt; these bracts give the appearance of ray-flowers. Florets greenish-yellow.—Distributed over the entire Alpine chain, to an altitude of 1900-2900 m., on stony pastures and rocky detritus in the neighbourhood of the snow-line; preferably on limestone. Fl. July to September.

Gnaphalium supinum *L. Niederes Ruhrkraut* (Cudweed). Plate 20, Fig. 2.—Small plant, scarcely more than 4 cm. high, forming a tuft, with narrow, linear leaves, covered with a thick felt. The stem bears at its apex a fascicle of few heads, often only a single head. Florets yellowish-white. The involucres are formed of two rows of scales.—Alpine chain, at an altitude of 1500-2300 m. above sea-level, in damp, gravelly places, also among undergrowth; occurs also in the Riesengebirge, on the Feldberg (Baden) and in the Arctic regions. Fl. July, August.

Gnaphalium norvegicum *Gunner.* Plate 20, Fig. 3. —Stem 12-25 cm. high, on the highest Alps only 3-5 cm. high. This Alpine Cudweed is very closely related to the *G. silvaticum L.* common throughout mid-Europe, but has a shorter, more condensed flower-spike and broader leaves, which are covered with thin felt on the upper side, and thick felt underneath; the leaves which are

situated half-way up the stem are the longest, often as much as 13 cm. long and ½-1 cm. broad. The brown involucral bracts form three rows.—In the Alps and Subalps of the entire Alpine chain, especially on primary rock, from Switzerland to Austria; also in the Riesengebirge, Erzgebirge, Vosges and Baden Black Forest. Fl. July, August.

Artemisia Mutellina *Villars. Edelraute* (Wormwood). Plate 20, Fig. 4.—Stem simple, 6-15 cm. high, the sterile stem forming a tuft. All the leaves stalked, *with grey, silky hairs*, the lower leaves tripartite-pinnatifid with linear-lanceolate segments, the upper ones digitately divided half-way. Heads in a raceme, erect, 5-15 in number, lax below, more crowded above. *Florets yellow.*—On sunny rocks and heaps of detritus. Distributed over the entire Alpine chain at an altitude of 1900-2700 m. above sea-level, frequent, especially on primary rock and in the neighbourhood of glaciers. Fl. July, August.

Artemisia spicata *Wulfen. Aehriger Beifuss.* Plate 20, Fig. 5.—Low plant, covered with grey, silky hairs; the sterile branches form loose tufts. Lower leaves stalked, digitately multifid; stem-leaves pinnatifid. Flowering stems 6-15 cm. high, simple. Heads yellowish; they are borne singly in the leaf-axils, and form a spiked raceme.—On rocks of Southern Switzerland, in Tyrol, Salzburg, Styria and Carinthia, at an altitude of 1800-2500 m. Fl. July, August.

Achillea moschata *L. Bisam - Schafgarbe, Wildfräuleinkraut, Iva* (Yarrow, Milfoil). Plate 20, Fig. 6.—

1. Leontopodium alpinum. 2. Gnaphalium supinum. 3. Omalotheca norvegicum. 4. Artemisia Mutellina. 5. Artemisia spicata. 6. Achillea moschata. 7. Achillea atrata. 8. Achillea nana.

Stem often only 4-8 cm., sometimes 15-18 cm. high. Leaves oblong, glabrous, pectinately pinnatifid, with entire pointed teeth. The flower-stems bear a corymb formed of 5-9 heads. Disc-flowers yellowish, marginal flowers white, sub-rotundate. The involucre consists of green leaflets, with a brown-red margin and darker green midrib.—In Switzerland, Tyrol, Styria and Carinthia, on primary rock, at an altitude of 1900-2200 m. Flowers in July and August; is used for the preparation of "Iva," an aromatic herbal liqueur.

Achillea atrata *L.* *Schwarze Iva.* Plate 20, Fig. 7. —More slender than the preceding or the following species. Stem 15-25 cm. high, with white hairs, slightly branched above. Leaves oblong, pinnately divided; pinnæ simple or 2-3-lobed or pinnately 5-fid, with mucronate segments. Involucral scales broadly margined with black. The 4-10 heads form a loose corymb. The 5-10 marginal florets are white.—Distributed over the entire Alpine chain, on limestone and primary rock, at an altitude of 1600-2200 m., especially in stony mountain-meadows and on the margins of streams. Fl. July, August.

Achillea nana *L.* Plate 20, Fig. 8.—Small plant, entirely clothed with grey-woolly to glossy silken hairs. Stem 4-15 cm. high. Leaves narrow lanceolate in general outline, pinnati-partite, only about 1 cm. broad. The heads form an almost globose corymb. Marginal florets white.—On primary rock of the Swiss and Tyrolean Alps, in the neighbourhood of the snow-line. Scattered and infrequent. Fl. July, August.

Chrysanthemum alpinum *L. Alpen Wucherblume.* Plate 21, Fig. 1. –The lower leaves, which form a tuft, are subrotundate-ovate in general outline, gradually narrowed to the base, pectinate-pinnatfid; lobes close together, entire. The few stem-leaves are linear, entire. Stem, 3-10 cm. high, bearing one flower. Disc-flowers yellow. Marginal (ray-) flowers white, often tinged with red, with 3-toothed blunt apex. The involucre is over 1 cm. long, covered with green, blackish-bordered scales. —Throughout the entire Alpine chain, from Switzerland to Carinthia, in stony places, at an altitude of 1700-2500 m. Usually frequent. Fl. July, August.

Chrysanthemum atratum *De C.*—Resembling the former species, but more elongate. Stem 8-18 cm. high. Lowest leaves spatulate, long-stalked, entire at the narrowed base, further up inciso-dentate. Stem-leaves lanceolate, inciso-serrate, the uppermost stem-leaves regularly toothed. Flower-head 3 cm. broad. Disc-flowers yellow, marginal flowers white, 3-toothed at the apex. Involucral scales green, with broad, purple-black margin.—In rocky places of the entire Alpine chain to an altitude of 2200 m. above sea - level, especially on limestone. Fl. July, August.

Achillea oxyloba *Schultz Bip. Alpen-Hundskamille.* Plate 21, Fig. 2.—Stem erect or ascending, increasingly woolly above, 5-15 cm. high. Leaves pectinate, pinnatipartite. Lobes linear, acuminate, some undivided, some 2-3-fid. Flower-heads $2\frac{1}{2}$-3 cm. in diameter; disc-flowers yellowish-white, the blunt ovate marginal flowers white. Receptacle semi-globose. Involucral scales blunt, lacerato-dentate above, spotted with black.—On the highest Alps

in Tyrol, Salzburg, Styria, Carinthia and Carniola, to an altitude of 2200 m. above sea-level, especially on limestone. Fl. July, August.

Doronicum cordatum *Sch. Bip. Herzblätterige Gemswurz* (Leopard's-bane). Plate 21, Fig. 3.—The perennial root-stock oblique, præmorse. Stem, according to locality, 15-30 cm., or even 1 m. high. The entire plant is glabrous, more rarely shortly pubescent. Radical leaves very long-stalked, subrotundate-ovate, deeply cordate, coarsely toothed. Stem-leaves amplexicaul with deeply cordate base. Flower-heads mostly single, seldom 2 or 3, in diameter 4-5 cm.; disc and marginal flowers yellow. The involucre only one-third the length of the florets.—In rocky places and in woods, from Tyrol through Salzburg and Styria to Austria, at an altitude of 1300-2000 m. above sea-level, especially on limestone. Fl. from June to August.

Doronicum Pardalianches *L.* Resembling the last species, but the root-stock throws out underground, elongate, at length tuberously-thickened stolons, which bear leaves and again throw out stolons. Stem 30-60 cm. high; lower leaves long-stalked, deeply cordate, the middle ones with auriculate leaf-stalk, the upper ones sessile. Stem and leaf-stalk roughly hairy. Flower-heads conspicuous, yellow; the disc-florets darker than the ray-florets; the latter end in 3 small teeth.—In Alpine meadows and mountain-woods. Distributed over the entire Alpine chain, from Switzerland to Carniola; also here and there in the central ranges of South Germany, and in the valley of the Moselle. Fl. May, June, July.

Aronicum glaciale *Reichenbach. Gletscher-Gemswurz.* Plate 21, Fig. 4.—Stem 8-15 cm. high, erect, rough-haired, bearing a single flower. Leaves thick and stiff, brittle, clearly veined, ovate, sinuately toothed; the lower ones stalked, the upper amplexicaul. The large flower is golden-yellow; its marginal florets 3-4-nerved, 3-toothed at the apex, expanded at night.—Distributed over the Alpine chain, at an altitude of 1900-2600 m., frequent; especially on primary rock in the neighbourhood of glaciers. Fl. July and August.

Arnica montana *L. Gemeiner Wohlverleih.* Plate 21, Fig. 5.—Stem 30-60 cm. high, with glandular hairs and 1-2 pairs of *opposite* narrow leaves. Radical leaves oblong-ovate, 5-nerved. The flower-stalk bears 1-5 yolk-yellow heads, which are 3-4 cm. in diameter, and have a peculiar resinous odour.—Over the entire Alpine chain in meadows and pastures, at an altitude of 1000-2000 m., frequent; also in damp and turfy mountain-meadows in South and Mid-Germany, in the North also in the plains. Fl. from May to July. Root and flowers have a very bitter, aromatic taste, and are used medicinally.

Senecio abrotanifolius *L. Stabwurzblätteriges Kreuzkraut.* Plate 22, Fig. 1.—Stem and leaves glabrous. The perennial, procumbent root-stock bears several stems 8-25 cm. high. Lower leaves doubly pinnatipartite; lobes narrowly linear, entire, those at the base smaller, without auricles. The 3-6 flower-heads are yellow with spreading orange-yellow, 5-nerved marginal flowers (ray-flowers), and form a loose corymb.—On stony slopes of the Alps and Subalps; Eastern Switzerland, Tyrol, Salzburg, Styria, Carinthia, at an altitude of 1200-1900 m.

1. Chrysanthemum alpinum. 2. Achillea atrata. 3. Doronicum cordatum.
4. Aronicum glaciale. 5. Arnica montana.

above sea-level, especially on limestone. Fl. July, August.

Senecio Doronicum *L.* Plate 22, Fig. 2. –Stem 30-50 cm. high, simple or sometimes sparely branched. Leaves leathery, rough with short hairs, or almost glabrous, lower ones stalked, oblong-lanceolate, toothed; upper ones sessile, lanceolate, toothed to entire. Flower-heads single, or 2-3 together, at the end of the stem, conspicuous, 3-4 cm. in diameter, with 12-20 orange-yellow marginal flowers.—Distributed over the entire Alpine chain at an altitude of 1300-2300 m. above sea-level; and most frequent on stony slopes. Fl. June to August.

Senecio incanus *L.* Plate 22, Fig. 3.—Stem 6-15 cm. high. Entire plant covered with grey to white felty hairs. Leaves stalked, pinnatifid, the lobes blunt, 2-3 times crenate. The stem bears a corymb of 6-8 golden-yellow flower-heads.—In high Alpine meadows near the snow-line and glaciers; Pyrenees, Switzerland, Styria, the Carpathians, scattered and rather rare. Fl. July, August.

Saussurea alpina *De C. Alpenscharte.* Plate 22, Fig. 4.—Stem erect, woolly-felty, 15-30 cm. high. Leaves with a web-like felt underneath, ovate to lanceolate, entire or sinuato-dentate, 10-18 cm. long; the lower ones narrowed into the winged leaf-stalk, the upper ones shorter and sessile. The flower-heads form a compact, short-stalked corymb of 2-5 purple-red flowers. The imbricate involucral leaves are red-brown, but covered with glossy wool and are blackish at the point.—In meadows and pastures of the granite Alps, at an altitude of 2000-2500 m. above sea-level; Switzerland, Tyrol, Salz-

burg, Carinthia and Carniola; also in the far north of Europe and North America. Fl. July, August.

Saussurea pygmaea *Sprengel.*—Stem 10-15 cm. high. Leaves linear, entire, with scattered hairs on the upper surface and with close soft hairs beneath. The stem bears only *one* violet-red flower-head.—Tyrol to Austria and Carniola, in dry places in the limestone mountains, to an altitude of 2700 m. Fl. July, August.

Aposeris foetida *Lessing. Stinksalat, Drahtstengel.* Plate 22, Fig. 5.—Glabrous or sparsely hairy plant, resembling the common Dandelion. The short, nodulosely thickened root-stock has an unpleasant smell. Stem slender, 15-20 cm. high, leafless; at the apex *only one* lemon-yellow flower-head. Leaves all radical, runcinately-pinnatifid; lobes almost rhomboidal, the terminal one, with 3-5 segments, recalling the form of an ivy leaf.—In leafy woods and in meadows of the Alps and Subalps of Austria, Salzburg and Carinthia; also in the Bavarian tableland near Munich and Augsburg. Fl. July, August.

Leontodon pyrenaicus *Gouan. Alpen-Löwenzahn.* Plate 22, Fig. 6.—Stem leafless, scaly, gradually thickened above, usually only 8-15 cm. high. The radical leaves, which are glabrous, or have only a few scattered simple hairs, are oblanceolate, dentate, or repando-denticulate, 2-7 cm. long, and 6-14 mm. broad. The stem terminates in *one* golden-yellow, more rarely orange-red, flower-head, cernuous before flowering, 2-3 cm. in diameter.—In meadows at an altitude of 1200-1900 m. Distributed over the Alpine chain, frequent; also locally in the Vosges and Black Forest. Fl. from June to August.

1. Senecio abrotanifolius. 2. Senecio Doronicum. 3. Senecio incanus.
4. Saussurea alpina. 5. Aposeris foetida. 6. Leontodon pyrenaicus.

Hypochoeris uniflora *Villars. Einblütiges Ferkelkraut* (Cat's-ear). Plate 23, Fig. 1.—Stem 7-30 cm. high, gradually becoming thicker upwards, ribbed, with stiff hairs. The radical leaves form a rosette, are oblong-lanceolate, repando-dentate, somewhat rough, with small stiff hairs; they are 4-10 cm. long, 1-3 cm. broad. The stem bears only *one* conspicuous deep-yellow flower-head, from 4-5 cm. broad; involucral leaves black-green, light-green at the margin, very villose, lacerato-fimbriate at the apex.—In meadows and pastures of the Alps and Subalps in Switzerland to Tyrol, Styria and Carinthia; also in Silesia, Bohemia, Moravia and on the Feldberg in the Black Forest. Fl. July, August.

Mulgedium alpinum *L.* (Sonchus alpinus *L.*) *Alpen-lattich, Alpensalat.* Plate 23, Fig. 2.—Conspicuous plant of $\frac{1}{2}$ to $1\frac{1}{2}$ m. high. Stem hollow, with glandular hairs, especially in the upper part. Lower leaves large, lyrate, with very large, triangular, hastate terminal segment; upper stem-leaves cordate at the base, lanceolate, sharply denticulate at the margin. The flower-heads form a simple or compound raceme, the stalks of which are thickly clothed with rust-red glands. Flowers blue or lilac, the marginal-florets radiating, the plant thus recalling the wild Chicory (*Cichorium Intybus L.*).—Distributed over the entire Alpine chain, to an altitude of 1600 m., on damp rocks and mountain-slopes, frequent; also in the North of Europe, as well as here and there in the mountains of Middle and South Europe (Riesengebirge, Thuringia, Vosges, Black Forest, etc.). Fl. July, August.

Crepis aurea *Cassini.* *Orangeroter Pippau* (Hawk's-beard). Plate 23, Fig. 3.—The radical rosette of leaves consists of glabrous, stalked, lanceolate, deeply toothed or runcinate-dentate leaves, 3-8 cm. long. The stem, 15-20 cm. high, is usually leafless, and, like the involucre, black-green above, with blackish hairs, and bearing a single dark orange-yellow flower-head, about 15 mm. broad.—In somewhat damp mountain-meadows, at an altitude of 1300-2500 m. Distributed over the entire Alpine chain and Subalps, frequent, especially on limestone. Fl. from June to August.

Crepis jubata *Koch.* *Gletscher Pippau, Bemähnter Pippau.* Plate 23, Fig. 4.—The simple stem, only 2-4 cm. high, is villose with yellowish hairs, as also the involucre. Radical leaves oblong-ovate or lanceolate blunt, entire or ligulato-dentate. The golden-yellow flower-head is about 2 cm. broad.—On the highest Alps of Switzerland (Zermatt, Bagne, Grisons) and of Tyrol (Fimber-glacier, etc.); scattered and infrequent. Fl. July, August.

Crepis alpestris *Tausch.* Plate 23, Fig. 5. — The rosette of radical leaves is formed of few, seldom more than 12, spatulate, lanceolate, repando-dentate or nearly runcinate leaves, which have small soft hairs on the nerves and veins of the under surface. Stem 15-30 cm. high, felty above, mostly simple, more rarely with 2-3 branches. Involucre grey-felty or short-haired. Flower-head golden-yellow.—Distributed over the entire Alpine chain and Subalps to an altitude of 1600 m. In rocky places, frequent; also on the Central ranges of South

1. Hypochoeris uniflora. 2. Mulgedium alpinum. 3. Crepis aurea.
4. Crepis jubata. 5. Crepis alpestris.

Germany (Jura region of Baden and Würtemberg). Fl. from June to August.

Hieracium aurantiacum *L.* *Orangerotes Habichtskraut* (Hawk-weed). Plate 24, Fig. 1.—Stem 25-30 cm. high, with few leaves in the lower part, rough, with long hairs, the upper part, and especially the flower-stalks, clothed with black, glandular hairs. Leaves oblong-ovate, grass-green, with long hairs above and below. Flower-heads dark orange-yellow, 2-10 together in a terminal corymb.—In dry meadows and pastures, at an altitude of 1300-1600 m. Distributed over the entire Alpine chain, frequent; also in the Subalps and the higher mountains of Mid-Europe (Riesengebirge, Harz, Vosges, Black Forest); in some localities not rare. Fl. from June to August.

Hieracium alpinum *L.* Plate 24, Fig. 2.—Stem stellately pubescent, 10-15 cm., rarely up to 30 cm. high, leafless, or bearing only 1-3 very small leaflets; at the apex generally only 1, more rarely 2 large golden-yellow flower-heads; involucre and flower-stalk with long black hairs. Radical leaves spatulate or oblong-ovate, gradually narrowed into the winged leaf-stalk, entire or slightly sinuato-dentate, green, with few long hairs.—In dry meadows and pastures of the entire Alpine chain, at an altitude of 1500-2200 m., usually frequent; also in the Arctic regions, in the Riesengebirge, in the Sudeten, Vosges, on the Brocken, in the Black Forest (Feldberg). Fl. July, August.

Hieracium villosum *L.* Plate 24, Fig. 3.—Stem and leaves woolly, with long hairs. Stem 15-20 cm. high,

usually simple, with 1, more rarely 2-3 golden-yellow flower-heads; flower-stalks covered with stellate hairs and long, white, woolly hairs; involucral leaves with long white hairs. Leaves bluish-green; the lower ones oblong-lanceolate, narrowed towards the base; the upper ones oblong-ovate, semi-amplexicaul. — In dry places, chiefly calcareous, on the Alps and Subalps at an altitude of 1200-2000 m.; frequent. Fl. from June to August.

XXIX. Family: Campanulaceæ.

Phyteuma comosum *L.* *Rapunzel* (Rampions). Plate 24, Fig. 4.—Stem often prostrate, 5-15 cm. high. Leaves toothed; the radical ones reniform, the stem-leaves oblong-lanceolate, larger. The short-stalked blue flowers form a terminal umbel and are dark-violet at the apex.—On dry rocks of South Tyrol, Carniola and Carinthia, at an altitude of 600-1500 m.; frequent. Fl. from June to August.

Phyteuma pauciflorum *L.* Plate 24, Fig. 5.—Stem only 2-5 cm. high. Leaves obovate to spatulate, often having at the point 3 crenate teeth. Heads with 5-7 blue or violet, stalked flowers, surrounded by green involucral leaves, which are subrotundate, villosely ciliate and shorter than the head. Stamens expanded at the base.—In meadows and pastures from an altitude of 1800 m. to the neighbourhood of the snow-line, distributed over the Alpine chain from Switzerland to Styria; frequent in some localities. Fl. July, August.

1. Hieracium aurantiacum. 2. Hieracium alpinum. 3. Hieracium villosum.
4. Phyteuma comosum. 5. Phyteuma pauciflorum.
6. Phyteuma hemisphaericum.

Phyteuma hemisphaericum *L.* Plate 24, Fig. 6.—Stem 4-12 cm. high. All the leaves linear, thin-stalked, usually entire, sometimes with 2-3 crenate teeth. Involucral leaves ovate, acuminate, ciliate, half as long as the head, which is about 12 mm. in diameter, and is composed of 10-12 blue or violet (rarely also white) flowers. Stamens expanded at the base.—In meadows and pastures, at an altitude of 1500-2200 m., distributed over the Alpine chain from Switzerland to Styria, frequent, principally on granite. Fl. July, August.

Campanula Zoisii *Wulfen. Glockenblume* (Bell-flower). Plate 25, Fig. 1.—Stem 5-10 cm., often only 2-3 cm., high. The close, radical leaves, which form a loose tuft, are ovate; the stem-leaves are rather distant, the middle ones are spatulate, the upper ones linear-lanceolate. Flowers light blue, ventricose, constricted below the mouth, thickly bearded inside; in small specimens they stand singly, in well-developed plants two or more together, at the apex of the stem.—On the eastern limestone rocks of Carinthia, Styria and Carniola, at an altitude of 2000-2700 m.; scattered, usually rare. Fl. July, August.

Campanula thyrsoidea *L.* Plate 25, Fig. 2.—The biennial root, which may attain the thickness of a finger, bears in the first year a crown of closely standing leaves, in the second year grows up into a strong stem 12-15 cm., sometimes even 30 cm., high, which, like the leaves, is covered with stiff hairs. Leaves oblong-lanceolate, entire, narrowed towards the base, 7-10 cm. long. At the end of the reddish-tinged stem stands a close spike of whitish

or greenish-yellow flowers, between each of which spring out 2 linear, hairy bracts. The 3-partite style projects beyond the corolla.—On stony and grassy slopes, distributed over the entire Alpine chain, at an altitude of 1600-2100 m., but scattered. Fl. July, August.

Campanula pusilla *Haenke.* Plate 25, Fig. 3.—8-15 cm. high. Radical leaves obovate, closely tufted, numerous, forming partly flowering, partly sterile fascicles; stem-leaves linear-lanceolate, slightly serrate, the upper ones linear, entire. Stem ascending, bearing 3-6 flowers. Flowers blue, ventricose, semi-globose-campanulate.—Distributed over the entire Alpine chain and Subalps, in dry, rocky and gravelly places, to an altitude of 2000 m.; descending with the rivers towards the plains; also locally in the region of the Danube in Würtemberg and in the Baden Black Forest. Fl. June, July.

Campanula pulla *L.* Plate 25, Fig. 4.—Generally only 3-12 cm., more rarely 15-20 cm., high. Leaves oblong-ovate, crenate, the lower ones stalked, the upper ones shorter and more pointed than the lower. Stem simple and always 1-flowered. The cernuous flower resembles that of *C. rotundifolia* (the little Harebell common throughout Europe), but is *darker blue.* Although these plants are only 1-flowered, they often form, when growing together, large groups of deep-blue bells, which in their general effect have a charming appearance.—In meadows and damp places at an altitude of 1300-1900 m. Distributed over the entire Alpine chain and the Subalps; especially in Austria, Salzburg, Styria and Carniola. Fl. from the end of June to September.

1. Campanula Zoisii. 2. Campanula thyrsoidea. 3. Campanula pusilla.
4. Campanula pulla. 5. Campanula barbata.

Campanula barbata *L.* Plate 25, Fig. 5.—The entire plant rough with hairs; stem 8-15 cm., more rarely 25-30 cm., high, and villose, especially above. Radical leaves oblong-lanceolate, entire or slightly crenate, upper ones lanceolate. Flowers stalked, racemose, 3-5 together, more or less secund and cernuous. Flower-bell 2-3 cm. long, light-blue or bluish-white, inside closely bearded at the top, almost 3 times as long as the calyx, which appears to have 10 segments owing to the deflexed appendages. —In meadows of the Alps and Subalps, at an altitude of 800-1800 m., frequent; also in the Riesengebirge, in the Moravian Gesenke and in the far North of Europs. Fl. from June to August.

Campanula alpina *L.*—The entire plant villose. Leaves linear, almost entire. Stem 2-5-flowered. Flower sometimes lighter, sometimes darker, blue, long-stalked cernuous. Appendages of the lanceolate calyx-lobe very short.—In Austria, Tyrol and Styria, on limestone Alps at an altitude of 1600-2100 m.; frequent. Fl. from June to August.

XXX. Family: Vacciniaceæ.

Vaccinium Vitis idæa *L.* *Preisselbeere*, *Kronsbeere* (Cowberry). Plate 26, Fig. 1.—Stem 10-15 cm. high, stout, branched, procumbent, bearing numerous evergreen, leathery, obovate leaves, with rolled edges, dotted beneath. The short, close, terminal, pendulous raceme consists of a number of flowers. Corolla white to rose-red, campanulate, with divaricate segments. Style longer than the corolla. Berries scarlet, universally esteemed as material

for a favourite jam.—Distributed over the entire Alpine chain in woods and on heaths to an altitude of 1900 m.; also in North and Central Europe; in some places frequent, and spreading over considerable areas of heathy ground. Fl. from May to August.

Of other species of *Vaccinium* which are distributed over a large part of Europe, and are also indigenous in the Alpine region, may be mentioned (1) the common Whortleberry or Bilberry, *Vaccinium myrtillus* L., Heidelbeere; (2) the woody *Vaccinium uliginosum* L., Sumpfheidelbeere, some 40 cm. high; (3) the low creeping Cranberry, *Vaccinium Oxycoccos* L., Moosbeere.

XXXI. Family: Ericaceæ.

Arctostaphylos alpina *Sprengel.* *Alpenbärentraube.* Plate 26, Fig. 2.—Low creeping shrub, with elongate, somewhat ascending, branches. Leaves herbaceous, obovate, net-veined, with small serrations at the margin, deciduous in autumn. The end of the flowering branch is surrounded by several oblong, rose-red, scale-like, somewhat woolly bracts. The 2 to 3, or rarely even 6, greenish-white flowers are cernuous, on short, curved stalks. The globose drupes are first red, later blue-black. —At an altitude of 1500-2000 m. Distributed over the entire Alpine chain, especially on limestone. Fl. from April to May and the beginning of June.

Arctostaphylos Uva ursi *Sprengel.* *Bärentraube* (Bearberry). Plate 26, Fig. 3.—The procumbent stem, 30-90 cm. long, forms conspicuous fascicles, with numerous

. Vaccinium Vitis idaea. 2. Arctostaphylos alpina. 3. Arctostaphylos uva ursi. 4. Erica carnea. 5. Loiseleuria procumbens. 6. Rhodothamnus Chamaecistus.

glossy, evergreen leaves; these are oblong-obovate, leathery, entire, not rolled at the edges, pale green beneath, net-veined. Flowers white, with rose-red, five-lobed limb, usually 4 to 6, in a compact, cernuous, terminal raceme. Drupe a beautiful red, glossy, globose.—Distributed over the entire Alpine chain, especially on limestone, frequent; also on heaths and in fir-woods of Mid-Europe, especially in North Germany. Fl. from April to July.

Erica carnea *L. Heide* (Heath). Plate 26, Fig. 4. —Stem ascending, 10-30 cm. high, closely set with aciculate leaves, in whorls of 3 to 4. The axillary flowers form leafy, terminal, unilateral racemes at the ends of the branches. The narrow, ovate, tubular corollas, 6 mm. long, are flesh-red, seldom white, longer than the green calyx.—Distributed over the entire Alpine chain, on heaths and in pine-woods, at an altitude of 1700-2200 m., especially on limestone. Locally also in Silesia, Bohemia, Moravia, Austria and Bavaria. Flowers in March, April, May, and is commonly introduced as a pretty, early-flowering garden plant.

Loiseleuria procumbens *Desfontaines. Azalie, Alpenheide.* Plate 26, Fig. 5.—Low, much-branched shrub with procumbent branches, 15-45 cm. long, densely clothed with leaves. Leaves oblong-ovate, evergreen, rolled at the margin, hard. Flowers small, rose-red, 2-6 together in terminal fascicles. — Alpine chain, at an altitude of 1500-2600 m.; particularly on dry, rocky parts of the schistose Alps, often extending over large stretches. Fl. from May to August.

Rhodothamnus Chamaecistus *Reichenbach.* *Alpenrose* (Alpine-Rose). Plate 26, Fig. 6.—Low shrub, which in the highest localities is generally only 15 cm. high, but at moderate altitudes is 30-45 cm. high. Leaves oblong to lanceolate, finely serrate, ciliate; otherwise glabrous and without glands. Flowers long-stalked, single or 2-3 together at the end of the branches. Corolla rotate, flat, pale pink. Anthers violet.—On the Alps and Subalps of Austria, Styria, Salzburg, Tyrol and Carniola, especially on rocks and detritus of limestone Alps, to an altitude of 1900 m.; scattered. Fl. May to July.

Rhododendron ferrugineum *L.* Plate 27, Fig. 1.—Evergreen, woody Alpine shrub, 15-60 cm. high. Leaves short-stalked, oblong, leathery, entire, *revolute at the margin and quite glabrous, with a rusty-red felt underneath* (by these characters this species is easily to be distinguished from the following one). Flowers cernuous, forming a corymb, at first purple-red, later rose-red. The outside of the corolla and the flower-stalks glandular-punctate.—Distributed over the entire Alpine chain and much of the Subalps, at an altitude of 1300-2000 m., principally on primary rock (granite). Fl. June, July, August.

Rhododendron hirsutum *L.* Plate 27, Fig. 2.—Resembling the former, but easily distinguished by the leaves, which are flat, *not revolute at the margin*, and are *ciliate;* also, *the lower surface* is *not rusty-red*, but green, and marked with numerous glandular dots. The flowers are much like those of the former species, but usually somewhat smaller.—This rhododendron is also distributed over the entire Alpine chain, but principally indigenous

on limestone, at an altitude of 1400-2300 m.; like the last species, it often covers large stretches, which during the flowering season make a fine show. Fl. May to August.

XXXII. Family: Pyrolaceæ.

Pyrola secunda *L.* *Wintergrün* (Winter - green). Plate 27, Fig. 3.—Stem 8-15 cm. high. Leaves evergreen, rather long-stalked, ovate, acuminate, finely toothed, strongly veined. The greenish-white, campanulate flowers form a many-flowered, unilateral raceme. Style long, almost straight.—In shady mountain-woods, scattered over the Alpine chain, to an altitude of 1900 m. Also in damp, mossy woods of Mid-Europe, here and there, usually scarce. Fl. from May to July.

Pyrola uniflora *L.* Plate 27, Fig. 4.—Radical leaves oblong to spatulate-ovate, slightly serrate. White flower solitary, conspicuously large, on an angular, glabrous stem, 3-8 cm. high. Style almost straight, with a large 5-lobed stigma.—In shady, mossy woods of Central and North Europe; distributed over the Alpine chain, to an altitude of 1600 m. above sea-level, as a rule frequent. Fl. from June to August.

XXXIII. Family: Aquifoliaceæ.

Ilex aquifolium *L.* *Gemeine Stechpalme* (Holly).—Tree-like shrub with thick glossy leaves, having sharp thorn-like teeth at the margin, white flowers and coral-red drupes.—In woods of West and South Europe, especially in the Alps, to an altitude of 1500 m. above sea-level. Fl. May, June, July.

XXXIV. Family: Gentianaceæ.

Gentiana acaulis *L.* *Enzian* (Gentian). Plate 27, Fig. 5.—Lower leaves herbaceous, somewhat leathery, oblong-rotundate to lanceolate, forming a radical rosette. Stem short, with a few lanceolate leaves. Calyx-teeth narrowed from a broad base, lanceolate, adpressed to the corolla tube. The clavate, campanulate corolla is 3 cm. long, dark azure-blue, rarely rose-red, or white.—This magnificent, large-flowered Gentian is distributed over the entire Alpine chain in meadows and pastures, at an altitude of 1400-2000 m., frequent, especially on primary rock. Fl. June, July, August.—The *Gentiana excisa* Presl. with soft, broad, less-pointed leaves, very short stem and slightly denticulate corolla-segments is, probably, only to be regarded as a somewhat varying form of *Gentiana acaulis*, and has the same distribution.

Gentiana bavarica *L.* Plate 27, Fig. 6. — Stem 2-20 cm. high. Leaves spatulate, blunt. The leaf-pairs of the sterile shoots and the lower leaves of the flowering shoots are crowded, the upper ones distant. Flowers bright azure-blue, solitary, with cylindrical tube 2 cm. long. Style deeply 2-fid.—One of the commonest Gentians throughout the entire Alpine chain, especially on limestone, at an altitude of 1300-2500 m. Fl. July, August.

Gentiana lutea *L.* Plate 28, Fig. 1 ($\frac{1}{2}$ natural size).—Conspicuous perennial plant, 60-130 cm. high. Root thick, cylindrical, annulate. Stem simple, perpendicular, terete, having at the base a rosette of broadly ovate,

1. Rhododendron ferrugineum. 2. Rhododendron hirsutum. 3. Pirola secunda.
4. Pirola uniflora. 5. Gentiana acaulis. 6. Gentiana bavarica.

acuminate, short-stalked leaves, 12-15 cm. long. Stem-leaves opposite, sessile with cordate base, semi-amplexicaul, 5-7-nerved. Flowers in axillary whorls. Calyx sheath-like, split down one side. Corolla rotate, 5-partite, *golden-yellow*, often spotted with brown dots.—Distributed over the entire Alpine chain, at an altitude of 1100-1600 m. In meadows and pastures; also locally in the Black Forest, the Vosges and on the Swabian Alb. Fl. July, August. The bitter root is officinal and is used in the preparation of " Gentian-bitter ".

Gentiana purpurea *L.* Plate 28, Fig. 2 ($\frac{2}{3}$ natural size).—Resembling the last species in growth, but generally only 30-60 cm. high. From the thick, roundish root-stock arise one or several green-red stems, which are terete below, slightly 4-angled above. Leaves ovate to oblong - rotundate, acuminate, 5-nerved. Flowers 3-5 together in terminal fascicles. Corolla campanulate, more than 2 cm. long, brownish purple-red with yellowish tube; rarely entirely yellow or white.— On Alpine meadows in Switzerland, Vorarlberg and Tyrol; scattered, only locally common. Fl. July, August. Root officinal, like that of the last species.

Gentiana Pannonica *Scopoli.*—Resembling the last species, 30-60 cm. high. Calyx-teeth recurved. Corolla campanulate, violet-purple-red with black-purple dots.—In the Alpine meadows of Tyrol, Austria and Styria, at an altitude of 1300-2000 m. above sea-level; principally on limestone. Fl. July to September.

Gentiana punctata *L.* Plate 28, Fig. 3 ($\frac{1}{2}$ natural size).—Resembling in growth the two last species, 30-60

cm. high. Lower leaves stalked, upper ones sessile, semi-amplexicaul. The flowers form several whorls in the axils of the leaves, the uppermost consisting of 6-8 flowers. These are about 2 cm. long, clavate-campanulate, *light yellow, spotted with dark purple*, rarely entirely straw-yellow.—On Alpine meadows of Switzerland to Salzburg and Upper Bavaria, at an altitude of 1200-2000 m.; also on mountain-crests of Bohemia and Moravia. Fl. July to September.

Gentiana asclepiadea *L.* Plate 28, Fig. 4.—Conspicuous perennial plant, 30-80 cm. high. Leaves numerous, lanceolate, acuminate, 5-nerved, rough at the edge. Flowers in the axils of the leaves, singly or 2 together, opposite, beginning above the middle of the stem, forming a long, leafy raceme; the corolla is clavate-campanulate, 4-5 cm. long, dark sky-blue, marked inside with darker spots, sometimes yellowish-white.—Distributed over the entire chain of the Alps and Subalps, to an altitude of 1700 m., especially in woody meadows and in the Alpine valleys; frequent. Also in the Riesengebirge, Lausitz, and in the central mountains of South Germany, near Munich, Augsburg, etc. Fl. July to September.

Gentiana frigida *Haenke.* Plate 28, Fig. 5.—Rarely more than 5-8 cm. high. Leaves linear-lanceolate, 1-nerved. Flowers 1 to 2, almost sessile. The calyx is scarcely half as long as the corolla, which is 2-3 cm. long; the latter transparent yellowish-white or light water-blue, with 5 light-blue streaks inside.—On high granite Alps of Styria and Carniola, in the neighbourhood of the snow-line. Fl. July, August.

1. Gentiana lutea. 2. Gentiana purpurea. 3. Gentiana punctata.
4. Gentiana asclepiadea. 5. Gentiana frigida.

Gentiana pumila *Jacquin.* Plate 29, Fig. 1.—Main stem woody, shortly branched. The single stems only 1-4 cm. long, 1-flowered. Leaves linear, very pointed, scarcely narrower at the base than in the middle; the lower ones form a close rosette. Corolla up to 2 cm. long, with an expanded limb 12-20 mm. broad, not bearded, deeply azure-blue; lobes of the corolla ovate, pointed, and in their angles arise 2-pointed teeth.—On the highest Alpine meadows of Austria, Styria and Carniola, to an altitude of 2000 m. above sea-level; scattered. Fl. July, August.

Gentiana brachyphylla *Villars.* Plate 29, Fig. 2.—A dwarf form, resembling the last species, only 1-4 cm. high, distinguished by its *subrotundate-ovate*, crowded leaves, forming groups of radical rosettes; but it so nearly resembles *G. verna* that it is often regarded as a variety of that species. The flowers are solitary at the apex of the short branchlets; corolla with cylindrical tube, 13-18 mm. in diameter, azure-blue.—On the highest granite Alps. Distributed over the entire Alpine chain, from Switzerland to Styria and Carinthia. Fl. July, August.

Gentiana verna *L.* Plate 29, Fig. 3.—Stem only 2-8 cm. high. The basal leaves, which form a rosette, are ovate to oblong-rotundate, the upper 1-2 pairs more distant and pointed. Flowers single at the end of the short, erect stems. Calyx elongate-cylindrical, with 5 pointed teeth, the angles of which are narrowly winged; corolla-tube cylindrical, arising high above the calyx. Corolla flatly expanded, azure-blue.—In meadows, distributed over the

entire Alpine chain and Subalps, to an altitude of 2800 m., frequent ; also in South and Mid-Germany, Bohemia and Moravia, here and there. Fl. in April and May ; on the higher Alps in June, July.

Gentiana utriculosa *L.* Plate 29, Fig. 4.—Stem 12-15 cm. high, many-flowered. Radical leaves in rosettes, ovate ; the stem-leaves oblong, rather distant. The green calyx is much inflated, narrowed above, broadly winged at the angles. Corolla-tube cylindrical, throat not bearded. Corolla a beautiful blue, with acuminate segments, and between each are two white-blue, smaller segments.—Distributed over the entire Alpine chain and Subalps to an altitude of 1700 m., frequent in damp and stony pastures ; also locally in the Vosges, the region round Lake Constance, and in the Rhine - Palatinate. Fl. May to August.

Gentiana nivalis *L.* Plate 29, Fig. 5.—Stem 2-15 cm. high, erect, pyramidally branched, bearing 1 to many flowers, closely set with oblong, blunt leaves. The green calyx is narrowly cylindrical, angular, divided to the middle. Corolla 8-15 mm. broad, dark azure-blue, not bearded ; with truncate appendages between the corolla-segments.—Distributed over the entire Alpine chain, the Jura and the Pyrenees, ascending to an altitude of 3000 m. Fl. July to September.

Gentiana prostrata *Haenke.* Plate 29, Fig. 6.—Stem procumbent - ascending, producing at the base several branches, 2-5 cm. long, which bear one flower at the apex of each. Leaves numerous, obovate to oblong, aggregated at the base, imbricate, becoming more distant

1. Gentiana pumila. 2. Gentiana brachyphylla. 3. Gentiana verna.
4. Gentiana utriculosa. 5. Gentiana nivalis. 6. Gentiana prostrata.
7. Gentiana ciliata. 8. Gentiana nana.

above. Flowers light water-blue, 8-12 mm. broad, not bearded.—On the highest Alps of Tyrol to Austria and Carniola; also in the far North. Fl. July, August.

Gentiana ciliata *L.* Plate 29, Fig. 7.—Stem 10-30 cm. high, simple or slightly branched. Leaves linear-lanceolate. Flowers conspicuous, 4-lobed, sky-blue, the single segments with long-fringed margins.—Distributed over the entire Alpine chain to an altitude of 1900 m., but also frequent here and there in Germany, especially on limestone mountains. Fl. from August to October.

Gentiana nana *Wulfen.* Plate 29, Fig. 8.—Stem, branched at the base, rarely above 5 cm. high, delicate, each bearing one flower. Leaves small, obovate. Green sepals, ovate, acuminate. Corolla tubular, bearded at the throat, the bluntish segments violet.—On the highest Alps of Salzburg and Carinthia, in the neighbourhood of the snow-line; scattered. Fl. July, August, September.

XXXV. Family: Polemoniaceæ.

Polemonium caeruleum *L.* *Blaues Sperrkraut, Himmelsleiter* (Jacob's ladder). Plate 30, Fig. 1.—Conspicuous perennial plant, 30-125 cm. high. The radical leaves form a close fascicle; the common petiole is 12-15 cm. long, and bears 11-21 lanceolate, entire pinnæ or leaflets. Stem erect, glabrous, 40-60 cm. high, with few smaller pinnate leaves and a terminal, loose raceme of blue, seldom white, flowers, 2-3 cm. broad.—Distributed along the Alpine chain and Subalps, in damp pastures and at the margin of woods, to an altitude of 1500 m.;

also in North Europe, and scattered here and there in Germany, for example in Pomerania, the Harz and the region of Lake Constance. Fl. from May to July; also known as a favourite garden-plant.

XXXVI. Family: Boraginaceæ.

Myosotis alpestris *Schmidt. Alpen-Vergissmeinnicht* (Forget-me-not). Plate 30, Fig. 2.—Low plant with stiff hairs, forming tufts, an exceedingly lovely ornament of the high Alpine pastures, but probably only to be regarded as the Alpine form of the Wood Forget-me-not (*M. sylvatica*), so widely distributed in the mountain-woods of Mid-Europe. Lowest leaves spatulate, stem leaves elongate-lanceolate. Flowers in short racemes. Corolla-tube quite enclosed in the whitish-grey calyx. Corolla at first rose-red, later a splendid sky-blue, rarely white. —In dry meadows and pastures distributed over the entire Alpine chain and Subalps, to an altitude of 2000 m., frequent; also in the Riesengebirge, the Vosges, on the Rauhe Alb and other high mountains. Fl. June, July.

Eritrichium nanum *Schrader. Himmelsherold, Zwerg-Vergissmeinnicht.* Plate 30, Fig. 3.—Elegant little plant, forming tufts, villose with silky hairs, having several stems, 1-4 cm. high, which are closely covered below with ovate-lanceolate leaves, and at the end bear a few-flowered raceme. Corolla 5-6 mm. wide, sky-blue with yellow throat.—Distributed over the primary rocks in Switzerland, Tyrol, Styria and Carinthia, to an altitude of 2300 m., but scattered. Fl. July, August.

1. Polemonium coeruleum. 2. Myosotis alpestris. 3. Eritrichium nanum.
4. Erinus alpinus. 5. Linaria alpina.

XXXVII. Family: Scrophulariaceæ.

Erinus alpinus *L.* *Alpen-Leberbalsam.* Plate 30, Fig. 4.—5-15 cm. high. From the short root-stock arise 1 or 2 flowering stems, the lower leaves of which are crowded into a rosette, spatulate, crenate-serrate at the tip; upper stem-leaves more distant, gradually narrowed into the stalk; the violet, deeply 5-lobed flowers, saucer-shaped, form a corymb, which lengthens after flowering. —On the Alps of Switzerland and in Tyrol, at an altitude of 1300-2400 m.; in dry mountain-meadows and in grassy, stony places, scattered; also in the Jura, the Vosges and Pyrenees. Fl. from May to August.

Linaria alpina *L.* *Alpen-Leinkraut* (Toad-flax). Plate 30, Fig. 5.—Glabrous, grey-green plant, from the root-stock of which spring, close to the ground, several prostrate or creeping branches 8-15 cm. long, somewhat ascending at the end. The leaves are borne in threes or fours, and are small, linear-oblong. The flowers are borne at the end of the branches in a short, loose raceme. The long-spurred flowers are red-violet; the deeply-cut, 2-lobed upper-lip is erect, the broad 3-lobed under-lip is of a fine orange-yellow at the so-called palate.—Frequent over the entire Alpine chain, to an altitude of 2000 m. on sand and stony detritus; descends also with the rivers into the valleys and into the subplains of South Germany. Fl. June to September.

Veronica fruticulosa *L.* *Strauchiger Ehrenpreis* (Speedwell). Plate 31, Fig. 1.—Delicate shrub-like plant with one or more ascending stems, 6-15 cm. high, woody below. Leaves decussate, glossy-green, oblong-

ligulate, slightly crenate; the lower ones smaller. The *rose-red* or whitish flowers, streaked with darker veins, form a loose, terminal raceme, the sepals of which are closely set with glandular hairs.—Scattered over the entire Alpine chain, to an altitude of 2400 m., and over the Subalps, especially on primary rock. Fl. July, August.

Veronica fruticans *Jacquin.* Plate 31, Fig. 2.—Resembling the last species in growth and size, stem ascending, 6-10 cm. high, leaves small, obovate, entire or slightly crenate at the end. Flowers 2-6 together in a short raceme, large, *dark-blue*, with a purple-red ring at the throat.—Distributed over the Alpine chain, especially on limestone, at an altitude of 1500-2400 m., frequent; also on certain heights of the Baden Black Forest (Feldberg, Belchen). Fl. from June to August.

Veronica alpina *L.* Plate 31, Fig. 3.—The thin, creeping root-stock throws out several stems, but often only one, 5-10 cm. high, which is rough with hairs and closely set with pairs of leaves. Leaves oblong-rotundate to subovate, usually entire. Flowers 4-5 together, at first in a capitate, later in a more elongate, roughly-hairy raceme. Corolla *small*, *dark-blue*.—Distributed over the entire Alpine chain, frequent; also in the Riesengebirge and in the far North. Fl. July, August.

Veronica Bonarota *L. Blaues Mönderle.* Plate 31, Fig. 4.—Entire plant hairy with short bristles. Stem 8-20 cm. high, erect or ascending. Leaves opposite, ovate, pointed, coarsely crenate-serrate. Flowers in a short, terminal raceme. Calyx and bracts purple-red; corolla

1. Veronica fruticulosa. 2. Veronica fruticans. 3. Veronica alpina.
4. Veronica Bonarota. 5. Wulfenia Carinthiaca. 6. Tozzia alpina.
7. Pedicularis rostrata.

blue, infundibuliform, 2-lipped, with undivided upper-lip and 3-lobed under-lip; the 2 anthers and the still longer style project beyond the limb of the corolla.—In Southern Tyrol, in Lower Styria and Carinthia, in rock-crevices, to an altitude of 1500 m.; scattered. Fl. from June to August.

Wulfenia Carinthiaca *Jacquin. Kärntnerische Wulfenie, Kuhtritt.* Plate 31, Fig. 5.—Stem 15-45 cm. high, clothed with scattered, leaf-like scales. Radical leaves 10-15 cm. long, somewhat fleshy, bluntly serrate at the margin and crenate. The blue or dark-violet cernuous flowers have a whitish throat and form a close, terminal raceme, 5-6 cm. long.—In Upper Carinthia (Gailthal), at an altitude of 1500 m.; frequent in special localities. Fl. July, August.

Tozzia alpina *L. Alpenrachen, Dorant.* Plate 31, Fig. 6.—Stem erect, branching, 4-angled, 30-60 cm. high. Leaves ovate, 3- or 4-toothed, opposite. From the axils spring the solitary opposite flower-stalks, which bear at their apex short, leafy racemes. Corolla tubular, 2-lipped with 5 almost equal lobes, *yellow*, the lower-lip dotted with blood-red.—In damp, shady places, rich meadows and on wet rocks, distributed over the entire Alpine chain, at an altitude of 1300-2300 m., but scattered; also in Silesia, on the Malinow and on the Barania, near Teschen. Fl. July, August.

Pedicularis rostrata *L. Geschnäbeltes Läusekraut* (Lousewort). Plate 31, Fig. 7.—1-3 flower-stalks, procumbent or ascending, 7-15 cm. long. Radical leaves long-stalked, deeply pinnatifid, with doubly toothed pinnæ

and spreading segments. Raceme short. Corolla rose-red; upper-lip ascending vertically, then suddenly bent horizontally and rostrate-acuminate; the beak generally deep-red.—Distributed over the Alpine chain, from Switzerland to Austria, in stony Alpine meadows, at an altitude of 1200-2200 m., as a rule frequent; by preference on limestone. Fl. from July to September.

Pedicularis verticillata *L.* Plate 32, Fig. 1.—Stem 8-15 cm. high, unbranched, with rough, jointed villose hairs; the stem-leaves are borne *in a whorl of* 4. Radical leaves long-stalked, pinnate, the pinnæ teethlike, blunt. The whorl of leaves forms at the apex of the stem a *pale purple-red* flower-head, about 3 cm. long, and almost as broad. The single corollas end in a blunt upper-lip, of deeper colour at the apex, and a 3-lobed, reflexed under-lip. —Distributed over the entire Alpine chain and much of the Subalps; mostly frequent in damp, grassy places, at an altitude of 1200-2100 m., especially on limestone; also in the far North of Europe. Fl. June to August.

Pedicularis incarnata *Jacquin.* Plate 32, Fig. 2.—Stem erect, 15-45 cm. high, rising high above the radical leaves; these are deeply pinnatifid with narrow lanceolate, doubly serrate segments. The flower-spike, at first close, forms later a long, loose raceme, so that the single flowers are several cm. distant from each other. Corolla large, flesh-red, *with markedly sickle-shaped recurved, longly acuminate upper-lip.* — In stony and damp meadows over the entire Alpine chain, at an altitude of 1200-2000 m.; common in certain places. Fl. July, August.

Pedicularis recutita *L.* Plate 32, Fig. 3.—Stem 30-40 cm. high, with alternate leaves. Leaves deeply pinnatifid with lanceolate, pinnatifid-dentate pinnæ, the upper ones *broadly confluent at the base.* Flowers in a cylindrical spike. Corolla *brown-red;* upper-lip straight, not beaked, blunt, longer than the 3-lobed under-lip.—Distributed over the entire Alpine chain, at an altitude of 1200-2200 m., and frequent on damp Alpine pastures. Fl. from May to August.

Pedicularis tuberosa *L.* Plate 32, Fig. 4.—Root-stock thick, almost tuberous. The reddish stem simple, erect, 10-15 cm. high, with several alternate leaves. Radical leaves slender and graceful, long-stalked, deeply pinnatifid with toothed pinnules. The capitate flower-spike, about 3 cm. long, consists of *large, yellow* flowers, the hood of which is elongate-rostrate and scarcely longer than the 3-lobed, deflexed lower-lip.—Distributed over the entire Alpine chain, at an altitude of 1300-2200 m. above sea-level, and most frequent in damp Alpine pastures. Fl. July, August.

Pedicularis oederi *Vahl.* Plate 32, Fig. 5.—Stem tuberously thickened at the base, erect, 2-8 cm. high. Leaves pinnate, pinnæ of the upper leaves small, oval, doubly crenate. The conspicuous *yellow* flowers form an oval spike. The villose calyx is tubular-campanulate, pale red, with somewhat recurved teeth. The hood-like upper-lip is straight, only curved at the apex, without a beak, longer than the 3-lobed lower-lip; at the apex of the upper-lip, *on both sides, is a black-red or scarlet spot,* which specially distinguishes this Lousewort.—In the far North of Europe and on the Alps of Bavaria,

Salzburg, Tyrol and Styria ; also in the Northern Alpine chain of Switzerland, but wanting in the Swiss Central Alps.

Bartschia alpina *L.* *Alpenhelm.* Plate 32, Fig. 6.—Stem 15-30 cm. high, richly clothed with glandular hairs. Leaves opposite, sessile, ovate, crenate ; the upper ones smaller and often tinged with violet. Flowers solitary, axillary, in a short, leafy spike. Calyx deeply 4-lobed, flowers dark violet.—Distributed over the entire Alpine chain, and in damp meadows and pastures, at an altitude of 1300-1700 m. frequent ; also in the Arctic regions and in the central mountains of Middle and North Europe, in the Black Forest, the Vosges and the Riesengebirge ; in Bavaria, descending with the rivers to the tableland. Fl. June to August.

XXXVIII. Family : Labiatæ.

Horminum pyrenaicum *L.* *Pyrenäisches Drachenmaul.* Plate 33, Fig. 1.—Stem 20-30 cm. high ; the basal leaves, which form a rosette, are shortly stalked, ovate, crenate, pointed, with embossed, uneven surface. The whorls of flowers form a many-flowered, loose raceme at the end of the stem. Corolla violet or reddish, 15 mm. long.—On grassy, dry slopes and the margins of streams ; scattered over the entire Alpine chain, at an altitude of 1200-2000 m. ; in places covering large areas, especially on limestone. Fl. July, August.

Calamintha alpina *Lamarck.* *Alpen-Bergminze, Alpenquendel* (Calamint). Plate 33, Fig. 2.—From the many-headed root-stock rise several procumbent,

1. Pedicularis verticillata. 2. Pedicularis incarnata. 3. Pedicularis recutita.
4. Pedicularis tuberosa. 5. Pedicularis Oederi. 6. Bartschia alpina.

ascending stems, 10-20 cm. long. Leaves stalked, ovate, acuminate, narrowed into the stalk at the base, serrate towards the point. Flowers in whorls of 6. Corolla rose-red or pale violet, large, 2-3 times as long as the calyx.—Alpine chain and Subalps, at an altitude of 1000-1600 m.; as a rule frequent. Fl. from May to August.

XXXIX. Family: Lentibulariaceæ.

Pinguicula vulgaris *L. Gemeines Fettkraut* (Butterwort). Plate 33, Fig. 3.—Leaves spreading, broadly ovate, somewhat fleshy, and covered with small, crystal-like dots, waxy. Flower-stalks 6-10 cm. high, glabrous, with a single, conspicuous, *violet-blue* flower.—A plant of the far North and of the peat-bogs of Mid-Europe. It is also widely distributed in the Alps and locally frequent both in boggy meadows and on wet, rocky slopes. Fl. May, June, July.

Pinguicula alpina *L.* Plate 33, Fig. 4.—Much resembling the last species, but distinguished by its *white* flowers, decorated with 1-2 lemon-yellow spots. The spur of the corolla is short and blunt.—Alpine distribution and flowering season as in the last species.

XL. Family: Primulaceæ.

Androsace imbricata *Lamarck. Dachziegelblätteriger Mannsschild.* Plate 33, Fig. 5.—Small plant, forming cushions; stem only 4-6 cm. high, with lanceolate, blunt, felty-grey, closely imbricate leaves. Flowers terminal, white, with red throat.—On primary mountain-rocks of

Switzerland and Southern Tyrol, in the neighbourhood of the snow-line, at an altitude of 2000-3000 m. ; scattered. Fl. June, July.

Androsace helvetica *Gaudin.* Plate 33, Fig. 6.—Forms close and firm, semi-globose, moss-like cushions, in which are embedded the numerous flowers, white, with a yellowish centre. The numerous, fleshy, somewhat silken-glossy leaves have a blunt apex, and group themselves in a close mass on the short, congested, clavate branches.—Distributed over the entire Alpine chain, from Switzerland to Austria, at an altitude of 2000-3000 m., especially on limestone. Fl. July, August.

Androsace glacialis *Hoppe.* Plate 33, Fig. 7.—Resembling the last species, but usually forming loose cushions ; the flower-stalks as long as the rose-red flowers ; leaves lanceolate, velvety, with short stellate hairs, and towards the apex of the branch aggregated into a rosette. —On ridges and peaks of the higher granite Alps, from Carinthia through Salzburg, Tyrol and Styria, and through Switzerland (according to Schröter, is wanting in the Cantons Waadt, Freiburg, and Appenzell). Fl. July, August.

Androsace carnea *L.* Plate 33, Fig. 8.—4-10 cm. high, woody at the base ; at the summit of each barren shoot is formed a flat rosette of leaves, which together form a close tuft. The scapes, 2-5 cm. high, bear small umbels of 3-5 flesh-red flowers, with a yellow throat.—To an altitude of 2300 m., on the granite Alps and in the Subalpine region of South Tyrol and Switzerland ; scattered. Fl. July, August.

1. Horminum pyrenaicum. 2. Calamintha [illegible]. 3. Pinguicula [illegible]. 4. Pinguicula alpina. 5. Androsace imbricata. 6. Saxifraga [illegible]. 7. Androsace glacialis. 8. Androsace carnea. 9. Androsace villosa. 10. Gagea [illegible].

Androsace villosa *L.* Plate 33, Fig. 9.—The woody part of the stem lies on the ground and branches. At the apex of these woody branches stands a close, globose rosette of oblong-lanceolate leaves, clothed with white, villose hairs. The scape, 5-10 cm. high, bears an umbel of 2-6 white or pale red flowers, with a yellowish or red throat.—In Styria and Carniola, to an altitude of 2000 m.; scattered. Fl. July, August.

Douglasia vitaliana *Bentham and Hooker. Aretie, Goldprimel.* Plate 33, Fig. 10.—Stem creeping, 4-15 cm. long, with rosettes of many leaves. Leaflets linear-lanceolate. Corolla *yellow*, saucer-shaped, with a long tube.—On rocks of the highest granite Alps in Wallis and Tyrol; also in the Pyrenees. Fl. July, August.

Primula farinosa *L. Mehlprimel* (Bird's-eye Primrose). Plate 34, Fig. 1.—Stem 5-20 cm. high. Radical leaves oblong-ovate, bluntly crenate, on the lower surface *mealy-white*, as also the stem, flower-stalks, and calyces. Flowers 5-6 together in a close umbel. Corolla-tube $1\frac{1}{2}$ times as long as the calyx, corolla light lilac colour, with yellow throat.—Distributed over the entire Alpine chain, at an altitude of 2500 m., frequent; also in the far North, and here and there in marshy meadows of Central Europe; scattered. Fl. from May to July.

Primula Auricula *L. Gelbe Aurikel* (Auricula). Plate 34, Fig. 2.—Leaves flat, somewhat fleshy, bluish-green, entire, or somewhat toothed. The stem, 2-15 cm. high, bears a capitate umbel of 5 or more lemon-yellow scented flowers, the calyx of which is powdered with white.—On rocks and detritus of the entire Alpine chain, at an altitude

of 1000 to 2000 m., descending with the rivers into the plain; also locally in the Baden Black Forest (Feldberg). Fl. April and May. The species is regarded as the original form of the numerous brilliantly coloured varieties of Auricula, cultivated in gardens.

Primula longiflora *L.* Plate 34, Fig. 3.—7-15 cm. high. Leaves obovate, oblong, slightly crenate, grass-green above, slightly wrinkled, powdered with mealy-white beneath. The round scape bears an umbel of generally 3-5 flesh-red flowers, *the tube of which is three times as long as the calyx.*—In damp pastures of the highest primary rocks, to an altitude of 2000 m., in Tyrol, Salzburg, Carinthia and in Oberwallis. Fl. June, July.

Primula villosa *Jacquin.* Plate 34, Fig. 4.—Stem 2-8 cm. high. Leaves oblong- or subrotundate-ovate, thin, *on both sides sticky-pubescent*, coarsely toothed from the middle to the apex. The scape, which is clothed with short, sticky hairs, bears an umbel of 5-6, but often only 1-2, violet-red or cherry-red flowers, with yellowish or white throat.—On the higher granite Alps of South Switzerland, Styria, Tyrol, Carinthia and Carniola; scattered. Fl. May, June, July.

Primula glutinosa *Wulfen.* Plate 34, Fig. 5.—Stem 5-10 cm. high. Leaves oblong-cuneate, serrate from the middle to the apex, fleshy, sticky, glabrous. The scape bears 3-5 *violet-blue* flowers, with the fragrance of a Pink, with obcordate corolla-lobes; corolla-tube light-yellow.—In damp places on primary rock, at an altitude of 2000-2800 m.; Switzerland, Salzburg, Tyrol, Styria and Carinthia. Fl. July, August.

1. Primula farinosa. 2. Primula Auricula. 3. Primula longiflora.
4. Primula villosa. 5. Primula glutinosa. 6. Cortusa Matthioli.

Primula minima *L.* *Zwergprimel.* Smallest of the Primroses. This elegant little plant, only a few cm. high, bears on its short scape 1-2 conspicuous rose-red flowers, with saucer-shaped corolla, the 5 lobes of which are deeply incised. The leaves form a rosette ; they are 6-10 mm. long, leathery, *not* sticky, cuneate, entire, glabrous, truncate at the top, and sharply toothed.—Distributed over the Alpine chain of Switzerland, as far as Styria and Austria, at an altitude of 1700-2200 m., especially on damp limestone rocks ; also in grassy places and on rock-walls of the Riesengebirge. Fl. June, July.

Cortusa Matthioli *L.* *Heilglöckchen.* Plate 34, Fig. 6. —Rough-haired plant, 15-30 cm. high. Radical leaves long-stalked, oblong-cordate, lobed, serrate. The erect flower-stalk, which rises far above the leaves, bears a loose umbel of cernuous, purple-violet flowers.—In wet places, on banks of streams and in shady Alpine gorges of the entire Alpine chain, at an altitude of 900-1700 m., scattered. On the river detritus of the Lech, near Augsburg. Fl. June, July, August.

Soldanella alpina *L.* *Gemeine Alpendrottelblume, Alpenglöckchen.* Plate 35, Fig. 1.—Flower-stalk only 5-10 cm. high at the time of flowering. Radical leaves long-stalked, oblong-reniform, entire, 2-3 cm. broad. The slender flower-scape bears at its end 1-3 violet, campanulate flowers, which are widely open and infundibuliform, and for half their length finely fimbriate. The style is as long, or longer than the corolla.—Distributed over the entire Alpine chain, in pastures and among detritus, to an altitude of 2500 m., particularly on limestone ; also on the Feldberg (Baden Black Forest) and in the Moravian

Carpathians. Fl. in May in the Subalps; in higher localities in June and July, frequent at the edge of the melting snow.

Soldanella pusilla *Baumgarten.*—Resembling the last species, but distinguished by its smaller leaves, less open corolla and the fringe, which is only cut to a $\frac{1}{3}$ of its length; the style is shorter than the corolla.—Distribution the same, but more confined to primary rock. Fl. June, July.

Cyclamen europaeum *L. Gemeine Erdscheibe, Alpenveilchen.* Plate 35, Fig. 2.—From the tuberous root-stock arise several leaf- and flower-stalks. Leaves long-stalked, cordate, toothed; upper surface spotted with white, lower surface reddish. Flowers cernuous, purple-red, more rarely white, fragrant. Segments of the corolla retroflexed.—Distributed over the entire Alpine chain and Subalps, in shady, damp places and in woody mountain-valleys, scattered, locally abundant, as, for example, in Salzburg, Upper Bavaria and South Tyrol. Fl. from August to October.

XLI. Family: Globulariaceæ.

Globularia cordifolia *L. Herzblätterige Kugelblume.* Plate 35, Fig. 3.—Alpine plant 3-6 cm. high, forming tufts, with a woody procumbent root-stock. Radical leaves obovate, blunt at the point, emarginate or 3-toothed. Flowering branches erect with a terminal, semi-globose head of light-blue flowers.—On stony calcareous Alpine pastures, to an altitude of 2300 m.; frequent. Fl. June, July, August.

XLII. Family: Plumbaginaceæ.

Armeria alpina *Willdenow. Alpen-Grasnelke.* Plate 35, Fig. 4.—Entire plant glabrous. The radical leaves are linear, faintly 3-nerved, pointed. Stem 6-20 cm. high; flowers rose-red in terminal, globose heads, intermixed with scarious bracts.—In Alpine pastures, at an altitude of 1500-2300 m.; Salzburg, Tyrol, Styria, Carinthia and Austria. Fl. June, July, August.

XLIII. Family: Plantaginaceæ.

Plantago alpina *L. Alpenwegerich, Nadelgras* (Plantain). Small, inconspicuous Alpine plant. Leaves linear-lanceolate, glabrous or pubescent, 3-nerved. Flower-scapes 4-10 cm. high, somewhat longer than the leaves. Flower-spike short, oblong, 1-3 cm. long.—In Alpine meadows in Switzerland, Tyrol, Upper Bavaria, to an altitude of 2000 m. Fl. June, July.

XLIV. Family: Polygonaceæ.

Polygonum viviparum *L. Knospentreibender Knöterich.* Plate 35, Fig. 5.—15-30 cm. high. Root-stock tuberous, with a simple, erect stem. Leaves leathery, thick, rolled at the margin; the radical ones linear on long stalks, the few stem-leaves almost sessile. The terminal, slender spike, 3-6 cm. long, consists of small, white or pale reddish flowers; the lowest ones are transformed into small, pointed, bulb-like buds, by means of which the plant is propagated.—Distributed over the

Alpine chain, in dry meadows and pastures, to an altitude of over 2000 m., frequent, descending along the river courses to the plain ; also on the Swabian Alb and in the Arctic regions. Fl. from June to August.

XLV. Family : Thymelæaceæ.

Daphne striata *Trattinick. Gestreifter Seidelbast, Steinröschen.* Plate 35, Fig. 6.—Small, woody shrub, of 5-15 cm. high. Leaves linear-cuneate, with short, mucronate point. Flowers *pale purple-red*, glabrous, with a long tube and corolla of 4 segments, in fascicles at the ends of the branches, fragrant.—Distributed over the Alpine chain, at an altitude of 1700-2500 m., but scattered ; frequent, for example, in Tyrol and the Engadine, but wanting in Cantons Wallis, Waadt and Bern. Fl. June to August.

Daphne Cneorum *L. Heideröschen.* Plate 35, Fig. 7. —Procumbent shrub, of 8-30 cm. high. Leaves linear-cuneate, glabrous, sparse. Flowers in terminal, umbelliferous fascicles, short-stalked, pubescent, *rose-red*, fragrant. —In stony places of the Alps and Subalps, Switzerland to Lower Austria, to an altitude of 1600 m. ; also scattered on the central ranges of South Germany, Silesia and Moravia. Fl. May to July.

XLVI. Family : Santalaceæ.

Thesium alpinum *L. Alpen-Leinblatt* (Bastard Toadflax). Plate 36, Fig. 1.—Insignificant, glabrous plant, of 10-20 cm. high. Stem with one-sided, erect, spreading

1. Soldanella alpina. 2. Cyclamen europaeum. 3. Globularia cordifolia.
4. Armeria alpina. 5. Polygonum viviparum. 6. Daphne striata.
7. Daphne Cneorum.

branches, and sparse, linear, 1-nerved leaves. Flowers small; corolla divided into 4 segments.—Distributed over the Alpine chain, at an altitude of 1500-2200 m., frequent; also in the central ranges of Germany, here and there. Fl. June, July.

XLVII. Family: Empetraceæ.

Empetrum nigrum *L. Schwarze Krähenbeere, Rauschbeere.* Plate 36, Fig. 2.—Procumbent little shrub, with branches 30-50 cm. long, which form closely branched little bushes of 20-30 cm. in diameter. Leaves evergreen, close together, oblong to linear, revolute at the margin. Flowers very small, pale red. The globose, black fruits the size of a pea.—In damp, rocky places. Distributed over the entire Alpine chain, at an altitude of 1500-2200 m., frequent; also in the far North, and on the central mountains of North and South Germany; scattered. Fl. April and May.

XLVIII. Family: Salicaceæ.

Salix reticulata *L. Netzblätterige Gletscher-Weide* (Willow). Plate 36, Fig. 3.—Procumbent, much-branched shrub, scarcely more than 15 cm. high, with entire, subrotundate-ovate leaves, which are glabrous above, glossy green, *strongly net-veined*, and are white-felty beneath. Catkins long-stalked, silken-glossy.—Distributed over the Alpine chain, from Switzerland to Austria, especially on limestone, at an altitude of 1600-2000 m. Fl. July, August.

Salix herbacea *L.* Plate 36, Fig. 4.—Small, tuft-forming shrub, with underground, creeping main-stem and creeping branches, which only ascend 4-5 cm. Leaves oblong, green, glabrous, finely crenate and net-veined, glossy on both sides; catkins small, ovate.—In rocky places of the highest Alps, in the neighbourhood of the snow-line; also on the Riesengebirge. Fl. May, June.

XLIX. Family: Betulaceæ.

L. Family: Coniferæ.

We only mention here: Pinus Cembra *L.*, *Zirbelkiefer* or *Arve*, a tree, 15-20 m. high, with stiff, triangular needles and ovate cones, 4-6 cm. long. In high Alpine valleys of Switzerland, Tyrol and Salzburg.—Pinus Pumilio *Haenke. Legföhre, Knieholz, Latsche.* Procumbent or shrub-like, to the height of a man. Needles in pairs; cones glossy, shorter than the needles.—Distributed over the entire Alpine chain, to an altitude of 2000 m.

LI. Family: Orchidaceæ.

Orchis ustulata *L. Angebranntes Knabenkraut* (Dark-winged Orchis). Plate 36, Fig. 5.—15-20 cm. high. Leaves few, lanceolate. Flowers small, forming a close spike, blackish-brown in bud, giving a burnt appearance to the apex of the spike. Sepals deeply purple-red, connivent and forming a hood. Lip 4-lobed, white, with a few dark-red spots.—In dry, hilly meadows of Central and South Europe. In the Alps, especially on

1. Thesium alpinum. 2. Empetrum nigrum. 3. Salix reticulata.
4. Salix herbacea. 5. Orchis ustulata. 6. Orchis globosa.
7. Anacamptis pyramidalis. 8. Ophrys muscifera.

limestone, distributed to an altitude of 1900 m.; frequent. Fl. July, August.

Orchis globosa *L.* Plate 36, Fig. 6.—Stem 30-50 cm. high. Leaves lanceolate. Flowers light-pink, small, in globose or semi-globose spike. Lip deeply trifid; the middle segment oblong, broader than the 2 lateral ones, truncato-emarginate. Lip with darker spots.—In meadows of the Alps, to an altitude of 2000 m. Also scattered over the central mountains of South Germany, and in the Riesengebirge, Erzgebirge and in Bohemia. Fl. June, July.

Anacamptis pyramidalis *Richard.* Plate 36, Fig. 7. —Stem 30-50 cm. high, with lanceolate, pointed leaves. Flower-spike short, crowded, pyramidal. Flowers bright rose- or purple-red, with petals connivent into a hood and long thin spur directed downwards. Lip broad, 3-lobed.—In meadows and on dry mountain-slopes, scattered over all Central Europe; also in the Alps, to an altitude of 1600 m. Fl. July, August.

Ophrys muscifera *Hudson. Fliegenähnliche Frauenthräne* (Fly Orchis). Plate 36, Fig. 8.—Stem 15-30 cm. high. Lip oblong, velvety purple-brown, with an almost 4-cornered glabrous spot in the middle, *deeply 2-lobed at the point.*—In meadows, on mountain-slopes and peat-moors of Central Europe, the Alps and Subalps; scattered. Fl. May to July.

Ophrys aranifera *Huds. Spinnenähnliche Frauenthräne* (Spider Orchis). 15-30 cm. high. Lip oblong-ovate, undivided, convex, reflexed at the margin, blunt or slightly

emarginate at the point; purple-red, having in the middle 2-4 obliquely connected, glabrous, dull yellow, longitudinal lines.—In the Subalps of Switzerland, Upper Bavaria, Tyrol, Austria, scattered; also here and there on the central mountains of South and Central Germany. Fl. April to June.

Gymnadenia conopea *R. Brown. Fliegenartige Höswurz.* Plate 37, Fig. 1.—30-60 cm. high. Leaves longly-lanceolate. Flowers *rose-red* in close, elongate spike. The upper sepal and the petals form an oblong-ovate hood; lateral sepals spreading. Lip 3-partite, with bluntly-ovate lobes. The filamentous spur is almost twice as long as the ovary.—Distributed over the whole of Europe, especially on limestone; scattered on hills, meadows and mountain-slopes. Ascending in the Alps to an altitude of 1600 m.; frequent. Fl. June to August.

Gymnadenia albida *Hartmann.* Plate 37, Fig. 2.—15-20 cm. high, with few oblong-ovate leaves. Spike close, cylindrical, up to 4 cm. long, with numerous small, fragrant, *white* flowers. Lip deeply trifid, lobes entire, lateral ones pointed, the middle one twice as broad, oblong, blunt; spur short, only $\frac{1}{3}$ as long as the ovary.—In mountain-meadows in Northern and Arctic Europe; distributed over the Alpine chain, to an altitude of 1700 m., frequent; also here and there on the central mountains of Germany, the Rhine district and Holstein, scattered. Fl. June, July.

Platanthera bifolia *Reichenbach. Zweiblätterige Kuckucksblume* (Butterfly Orchis). Plate 37, Fig. 3.— 30-50 cm.

high, with 2 large opposite leaves, the stalks of which are surrounded by several sheaths. Flowers large, with a pleasant scent, greenish-white, in elongate loose spike. The two lateral petals divaricate, lip linear and undivided; spur filamentous, $1\frac{1}{2}$ or twice as long as the ovary.—Distributed from the Mediterranean to the Arctic circle, to an altitude of 1500 m. in the Alps, frequent on grassy slopes and mountain-meadows; also in open woods and woody meadows of Germany. Fl. from June to August.

Nigritella nigra *Reichenb.* *Schwarzstendel* ("Brändli," "Prunelle," "Bluttröpfl," etc.). Plate 37, Fig. 4.—Stem usually only 6 cm., more rarely up to 20 cm. high, with linear-lanceolate leaves, crowded at the base. Flower-heads at first globose, later ovate, *with a scent of vanilla, deep black-red* or purple-brown.—Distributed over the entire Alpine chain, in meadows and pastures, especially on limestone, to an altitude of 2000 m., frequent; also in the far North and in Scotland. Fl. from May to August. One of the most favourite types of the Alpine flora, and bearing many different trivial names among the inhabitants of the Alps.

Epipactis latifolia *Allioni.* *Breitblätterige Sumpfwurz* (Helleborine). Plate 37, Fig. 5.—Stem 50 cm. to 1 m. high. Leaves strongly nerved, the lower ones amplexicaul, ovate, the upper ones gradually narrower, the topmost bracts linear. The inflorescence forms a unilateral, loose raceme, up to 27 cm. long. Flowers stalked, green to brownish purple-red, namely, the three outer petals green to yellow-green, the two lateral ones green to rose-

red, the short cordate lip rose-red.—In open woods. Distributed over almost the whole of Europe, scattered in Germany, frequent in the Alps, to an altitude of 1500 m. Fl. July, August.

Listera ovata *Rob. Brown. Eiblätteriges Zweiblatt* (Twayblade). Plate 37, Fig. 6.—Stem 30-50 cm. high, 2-leaved; leaves ovate. Raceme slender, elongate, erect. *Calyx and petals greenish-yellow.* Lip pendulous, linear, 2-fid, much longer than the other petals, not spurred.—Widely distributed in woods and in damp meadows of Central Europe; as a rule frequent in Germany. In the Alps, to an altitude of 1800 m.; not rare. Fl. June, July.

Spiranthes spiralis *C. Koch. Herbst-Wendelorchis, Herbst-Blütenschraube* (Ladies'-tresses). Plate 37, Fig. 7. —Stem 15-20 cm. high, leafless, with sheaths. The 3-4 radical leaves ovate-oblong, contracted into the leaf-stalk. The small, white, fragrant flowers form a close, slender, spiral spike.—In meadows and on damp slopes. Distributed over the Alpine chain, to an altitude of 1800 m., scattered; in the central mountains of Germany, here and there. Fl. from August to October.

Cypripedium Calceolus *L. Gemeiner Frauenschuh* (Lady's-slipper). Plate 37, Fig. 8.—25-30 cm. high. Easily distinguished by the purple-brown petals and the very large, inflated, honey-yellow lip.—Scattered over the Alpine chain, especially on limestone, to an altitude of 2000 m. Also here and there in South and Central Germany; for example, the region of Lake Constance and Thüringia. Fl. May, June.

1. Gymnadenia conopea. 2. Gymnadenia albida. 3. Platanthera bifolia.
4. Nigritella nigra. 5. Epipactis latifolia. 6. Listera ovata.
7. Spiranthes spiralis. 8. Cypripedium Calceolus.

LII. Family : Iridaceæ.

Crocus vernus *Wulfen. Frühlings-Safran.* Plate 38, Fig. 1.—The narrow, linear leaves radical, enclosed in a small tube of 2-3 thin leaf-sheaths. Flowers violet-blue, more rarely white, with oblong-ovate, concave segments. Stigmas a fine orange-yellow, expanded at the tip and pectinately incised.—Frequent in South Europe and on the Southern limestone Alps ; also by the ruin of Zavelstein, in the Würtemberg Black Forest, in such quantity that when these plants are in flower (March, April) the meadows look quite blue.

LIII. Family : Amaryllidaceæ.

Narcissus Pseudonarcissus *L. Gelbe Narzisse* (Daffodil, Lent-lily).—25-30 cm. high, corolla and corona golden-yellow.—Widely known as a garden flower. Here and there wild in Germany. In meadows in Switzerland, for example, between Geneva and Zurich, as well as locally frequent in the western Jura. Fl. April, May.

LIV. Family : Liliaceæ.

Lloydia serotina *Reichenb. Berg-Faltenlilie.* Plate 38, Fig. 2.—8-10 cm. high ; the leaves, 2 or 3, are filamentous, elongate. Flower-stalk slender, with few narrow leaves and a single terminal flower, the petals of which are white, with 3 reddish lines on the inside and a small yellow spot at the base.—In rocky and stony pastures, especially on schist. Distributed over the Alpine chain, to an altitude of 2600 m. ; frequent. Fl. June to August.

Erythronium Dens-canis *L. Gemeiner Hundszahn* (Dog's-tooth Violet). Plate 38, Fig. 3.—Stem 10-15 cm. high, reddish, leafless. At the base 2-3 stalked, broadly lanceolate leaves, spotted with red. Flowers solitary, terminal, with pointed, retroflexed, rose-red segments.—Distributed over the Southern Alpine chain, from Switzerland to Tyrol, Styria and Carinthia, to an altitude of 1500 m., but much scattered; locally also in Bohemia. Fl. April, May.

Paradisia Liliastrum *Bertoloni. Trichterlilie, Alpenlilie.* Plate 38, Fig. 4.—30-40 cm. high. Stem simple, terete, leafless. Radical leaves linear, flat, somewhat channelled. The large, milk-white flowers form a few-flowered unilateral raceme.—In Alpine pastures, to an altitude of 2000 m., in Switzerland, Tyrol and Carinthia; scattered. Fl. July, August.

Gagea Liottardi *Schultes. Röhrenblätteriger Goldstern* (Yellow Star of Bethlehem). Plate 38, Fig. 5.—5-10 cm. high. The two radical leaves are filmentous, semi-terete. Stem-leaves opposite, the larger one sheathing and convolute. The 1-5, generally 2, flower-stalks are villose. Flowers stellately expanded, yellow, with 6 linear-lanceolate, pointed segments.—In meadows and pastures, at an altitude of 1200-1900 m. Distributed over the Alpine chain; Switzerland, Tyrol, Salzburg, Carinthia; frequent. Fl. May, June.

Lillium bulbiferum *L. Feuerlilie.*—Stem 30-50 cm. high, richly clothed with narrow, pointed leaves, in the axils of which are frequently borne small, often glossy, black bulbs. Flowers generally solitary, conspicuous,

1. Crocus vernus. 2. Lloydia serotina. 3. Erythronium dens canis.
4. Paradisia Liliastrum. 5. Gagea Liottardi. 6. Lilium Carneolicum.

fiery-red, spotted with dark-brown and with fleshy warts inside.—Distributed over the entire Alpine chain, to an altitude of 1600 m., in mountain-meadows and on stony slopes, but much scattered ; also in isolated localities in Silesia, Westphalia, the Thüringian Forest, and here and there as a garden escape. Fl. June, July.

Lilium Martagon *L. Türkenbundlilie* (Turk's-cap Lily).—30-60 cm. high ; leaves whorled, elongate-rotundate, lanceolate. Flowers in a terminal raceme, cernuous, spotted with dark purple-brown on a dirty-red ground ; the perianth leaves recurved.—In stony mountain-woods of Germany, scattered ; locally abundant. In the Alps, in similar localities, to an altitude of 1800 m., especially on limestone. Fl. June, July.

Lilium Carniolicum *L. Krainische Lilie.* Plate 38, Fig. 6.—Resembling the last species, but distinguished by its fiery, cinnabarine flowers, which are usually borne singly at the end of the stem ; this is 30-50 cm. high, and bears scattered leaves.—On stony mountain-slopes, to an altitude of 1500 m., in Carinthia, Styria and Carniola ; scattered, but locally abundant. Fl. July and August. Well known as a favourite garden flower.

Allium victorialis *L. Siegwurz, Allermannsharnisch.* —Plate 39, Fig. 1.—The sturdy bulb, of about a finger's length, is surrounded by scarious, net-like, fibrous scales. The terete scape, somewhat angular above, is 50-90 cm. high, and clothed half-way up with broad, lanceolate leaves, which are spirally arranged and amplexicaul at the base. The scape bears at its apex the globose umbel, the single flowers of which bear broadly-lanceolate, rather

pointed, greenish-white perianth-segments.—In rocky places of the Swiss and South German Alps, the Jura, and the Vosges, to an altitude of 1900 m.; also sparsely in Alsace, on the heights of the Baden Black Forest, and of the Riesengebirge. Fl. July, August.

LV. Family: Colchicaceæ.

Veratrum album *L. Weisser Germer.* Plate 39, Fig. 2 ($\frac{1}{2}$ natural size).—Large perennial herb, of $\frac{1}{2}$-1 m. in height. Stem leafy; leaves folded longitudinally, softly hairy beneath, the radical ones very large. The whitish or yellow-green flowers form a terminal, paniculate raceme. (Under the name of *V. Lobelianum* is distinguished by many people a variety, the perianth-leaves of which are green both inside and outside.)—Distributed over the entire Alpine chain, in damp meadows and pastures, at an altitude of 600-1700 m.; also in the Silesian mountains and on certain heights of the Black Forest. Fl. July, August. *Very poisonous;* from the root is extracted Veratrin, a whitish powder, used medicinally.

Veratrum nigrum *L.*—Resembling the former, but the flowers are brown or black-red.—In mountain-woods and on the Alps, at an altitude of 1000-1500 m.; South Switzerland, Austria, Styria, Carniola and South Tyrol. Fl. July, August.

Tofieldia palustris *D.C. Sumpf-Graslilie.* Plate 39, Fig. 3 (the supplementary figure represents a single enlarged flower).—The leafless stem is 4-8 cm. high.

1. Allium [illegible]. 2. Veratrum [illegible]. 3. Tofieldia [illegible].
4. Luzula lutea. 5. Eriophorum Scheuchzeri.

Leaves radical, grass-like, sword-shaped, mostly 3-nerved. The small, greenish-yellow flowers form a small, capitate raceme.—In marshy places of the highest Alps, to an altitude of 2700 m.; in Switzerland, Upper Bavaria, Tyrol, etc. Fl. from May to August.

LVI. Family: Juncaceæ.

Of this family, so rich in species and so well represented in the Alps, we mention as an example:—

Luzula lutea *De Cand. Gelbe Hainsimse* (Wood-rush). Plate 39, Fig. 4.—Stem 25-30 cm. high. Leaves linear-lanceolate, glabrous. Flowers golden-yellow, fascicled, in a short, spreading, composite cyme.—In meadows and pastures in Switzerland and Tyrol, at an altitude of 1200-2000 m.; frequent. Fl. June, July.

LVII. Family: Cyperaceæ.

Eriophorum Scheuchzeri *Hoppe. Kopfförmiges Wollgras* (Cotton-grass). Plate 39, Fig. 5.—Stem 10-30 cm. high, terete, bearing sheath-like, smooth, soft leaves below, the lowest having brown sheaths. At the apex of the stalk stands a solitary spike, globose even in flower, which is supported by lanceolate, blackish-green glumes; when the glossy, silken wool of the spike is mature, the compressed-globose head measures $2\frac{1}{2}$ - $3\frac{1}{2}$ cm. in breadth.—In high, marshy meadows throughout the entire Alpine chain, from Switzerland to Styria and Carinthia, at an altitude of 1600-2000 m. Fl. May, June.

Trichophorum Caespitosum. *Schur. Rasen-Binse* (Deer-hair, Tufted Club-Rush). Plate 40, Fig. 1.—Grows in dense cushions, often spreading over wide surfaces, from which numerous bristly erect flower-stems shoot up in early spring. Fl. May, June. Stems with ripening fruit last on to autumn.—On moors, slopes, and heights among the foot-hills. Up to an elevation of over 2000 m. Northern parts of continents round the Pole, mountains of Central Europe, and Himalayas.

Carex curvula. *Willd. Krumm-Segge* (Sedge). Plate 40, Fig. 2.—Forms tufts of closely-crowded, erect stalks, spikelets forming a head or dense oblong spike. From the tree-line to 3000 m.—On primary rocks where limestone is deficient. Narrow leaves shoot out in early spring but quickly die off from the apex downwards and change colour. This is due to a microscopic fungus which attacks the apices of the leaves. Scanty flower-stalks, barely a span high. Fl. June, July. Mountainous districts of Central Europe from the Pyrenees to Transylvania and the Balkans.

Carex firma. *Host. Polster-Segge.* Plate 40, Fig. 3.—Stem 5-20 cm. high; leaves short, stiff, linear-lanceolate. Plays the same part in the limestone districts of the Alps as the Curved Sedge on primary rocks. Tufts in form of semi-spherical cushions. The closely crowded leaves of each shoot in the cushion, spreading in three rows. The stiff flower-stalks few in number. Fl. May, June.—At an elevation of 1600-2600 m., masses of sedge cushions impart a peculiar character to the vegetation. Along shingle of rivers; descends as far as higher level of the foothills. Also in Carpathians and Transylvania.

1. Trichophorum caespitosum. 2. Carex curvula. 3. Carex firma. Nardus stricta. 5. Phleum alpinum. 6. Avena versicolor. 7. Poa alpina. 8. Sesleria caerulea.

LVIII. Family: Graminaceæ.

Nardus stricta *L.* *Borstgras* (Mat-grass). Plate 40, Fig. 4.—Grows in tufts of close-crowded, slender stems, 5-20 cm. high. Spikelets sessile, in two rows forming a one-sided spike, 2·5-7·5 cm. long.—On moors and heaths. Fl. June, July. Leaves and stems too hard for cattle to eat, and pulled-up tufts of mat-grass are often seen drying in the sun.

Phleum alpinum *L.* *Alpen-Lieschgras* (Cat's-tail grass). Plate 40, Fig. 5.—Stem 20-50 cm. high, bearing club-shaped panicles in which stamens appear July, August. Valuable fodder plant.—Grows at altitude of 1400 m., almost to the snow-line. Found in most mountains of the Northern Hemisphere and in South America.

Avena versicolor *Vill.* *Bunte Hafer* (Oat). Plate 40, Fig. 6.—Stem 25-40 cm. high. Spikelets variegated yellow, brown, violet, 5-flowered, numerous. Habitat from the tree-line up to the snow region on dry, thin ground where there is humus. Fl. July, August.—From the Pyrenees to the Carpathians and thence to the Caucasus and the Altai Mountains.

Poa alpina *L.* *Alpen-Rispengras* (Alpine Meadow-grass). Plate 40, Fig. 7.—Stem 15-20 cm. high, smooth; spikelets erect, 4-5-flowered, panicle erect.—Grows in small tufts on stony meadows and slopes up to snow-line. On rich meadows of mountain forest land, forms a valuable part of the hay crop. Instead of flowers the spikelets often replaced by viviparous buds. The young plants

thus formed soon drop off and take root in the ground. Found in most mountains of the North Temperate Zone.

Sesleria caerulea *Arduino. Blaugras* (Blue Moor-grass). Plate 40, Fig. 8.—A perennial 15-30 cm. high, erect, smooth. From a creeping rhizome forms loose tufts on stony meadows and dry slopes, also on strips and blocks of rock. Abundant in places in limestone districts. Fl. May, June. The narrow leaves spread out flat in wet weather, and roll up longitudinally in dry.—Common in the Alps from the valley almost to the snow-line, and throughout Central Europe northwards as far as Scandinavia.

LIX. Family: Filices (Ferns).

Allosorus crispus *Bernh. Krause Rollfarn* (Curled Rock Brake, Parsley Fern, Rock Bracken). Plate 41, Fig. 1.—Fronds 7·5-20 cm. high, of two kinds (1) fertile, bipennate with oblong fusiform pinnules, mostly narrower, and with longer stalks than: (2) the barren fronds; bi- or tri-pinnate. Occasionally the upper section of a frond is fertile and the lower barren.—Central Alps, also isolated in Black Forest and Bavarian woodlands; found also in mountains of Central Europe from Pyrenees to Transylvania, Caucasus, North Russia and Scandinavia.

Asplenium viride *L. Grüne Strichfarn* (Green spleen-wort). Plate 41, Fig. 2.—Fronds 10-15 cm. high, with 12 to 20 pinnæ on each side, rachis green, segments with short stalks, crenate, light-green. Sori copious.—Grows in crevices in walls, on the bed of moss on tree-stumps, on stony slopes and clefts in the rock. From the plain up to 2700 m.

Allosorus crispus. 2. Asplenium viride. 3. Asplenium trichomanes. 4. Asplenium
ta muraria. 5. Asplenium septentrionale. 6. Cystopteris regia alpina. 7. Botrychium
naria. 8. Lycopodium Selago. 9. Selaginella helvetica. 10. Selaginella denticulata.

Found in the mountains of Europe, Caucasus, Asia Minor, Siberia and temperate North America.

Asplenium trichomanes *L. Braune Strichfarn* (Black or Maidenhair spleenwort). Plate 41, Fig. 3.—The pinnate leaves with stiff rachis are straight, blackish-brown, 4-15 cm. high, and form with their ovate pinnules elegant fascicles. Sori numerous on lower surface of pinnule, at first separate, later confluent in a circular mass.—On rocks, walls, and stony slopes from the valley up to 1600 m. Widely distributed in the temperate zones and mountainous districts in warmer zones. Fr. May to October.

Asplenium ruta muraria *L. Mauerraute* (Wall-rue). Plate 41, Fig. 4.—Fronds oblong or ovate, irregularly bipinnate, densely tufted, rather dark-green, 5-15 cm. high.—Grows on walls and rocks up to 2000 m. Common everywhere in the Alps and Central Mountain chains, all over Europe, the Near East and North America.

Asplenium septentrionale *Hull. Nordische Strichfarn* (Forked spleenwort). Plate 41, Fig. 5.—Resembles Asplenium ruta muraria. Tufted fronds 5-15 cm. high, pinnatifid. Frond usually consists of a stalk forked towards the top, each branch with a single linear entire or 3-lobed terminal segment. Fr. summer and autumn.—Thrives only on primary rocks deficient in limestone, in sunny situations in crevices on rocks and walls. Up to 2500 m. from mountains of Europe eastwards to Himalayas and Altai Mountains, also in North America.

Cystopteris regia alpina *Link. Alpen-Blasenfarn* (Alpine Bladderfern). Plate 41, Fig. 6.—Fronds 15-25 cm.

high. The opposite pinnæ almost 3-cornered, the single pinnulæ again deeply incised with obovate, truncate, emarginate 2-toothed segments; the terminal segment 3-4 toothed, nerves running into the incisions.—On loose shingle and crevices in rock in damp shady situations. From 1260 to 2530 m. Confined to Alps and Carpathians.

Botrychium lunaria *Swartz. Mondraute* (Moonwort). Plate 41, Fig. 7.—Stem 8-25 cm. high. Barren frond almost sessile, springing from the middle of the stem, pinnate; the lower pinnæ half-moon-shaped, the upper ones more cuneate, more or less lobed. Fruiting-spike terminal, long-stalked.—On dry, sunny meadows on Alps up to 2500 m. Throughout Europe, North Asia, North America, the temperate parts of South America and Australia. Fr. May to July.

LX. Family: Lycopodinæ (Lycopods).

Lycopodium Selago *L. Tannen-Bärlapp* (Fir Club-moss). Plate 41, Fig. 8.—Stem 5-15 cm. high, erect, forked. Leaves in 8 rows, lanceolate, dark-green with short, fine point. Spore-cases in axils of upper leaves.—Grows in shady places in woods and on rocky mountain slopes and meadows from the valley up to 3000 m. In all parts of the world except Africa.

Selaginella helvetica *Spring. Schweizer Moosfarn* (Swiss Lesser Club-moss). Plate 41, Fig. 9.—Stem procumbent, 5-7·5 cm. long; branches short, erect; leaves small, lanceolate, sessile, and of two different sizes.—Often abundant in turfy spots on slopes. In sunny situations leaves often beautiful red; scarcely reaches the

tree-line. Found in the Alps and Carpathians, Serbia, Asia Minor, Caucasus, Amur Region, Manchuria and Japan.

Selaginella denticulata. *Gezähnelte Moosfarn* (Toothed Lesser Club-moss). Plate 41, Fig. 10.—Grows in meadows on mountain slopes, if not too dry and stony. Shoots out in autumn, passes the winter under the snow and produces minute spores in May, June; then dies off. Chiefly in Mediterranean districts.

LXI. Family: Bryophyta (Mosses).

Sphagnum *Dillenius. Torfmoos* (Bog-moss). Plate 42, Fig. 1. Forms dense compact cushions which, in wet weather, soak up water like a sponge. The black globular capsules, when ripe, burst in sunshine or dry wind with a slight crack and scatter spores.—Grows up to 2000 m. and also on moors and in woods on the plain. Found all over the world, plays an important part as a turf-former in temperate and cold countries.

Andreaea petrophila *Ehrhart. Felsenmoos* (Split-moss, Rock-moss). Plate 42, Fig. 2.—Grows in small, blackish cushions on boulders and primary rocks, granite or slate, where limestone is deficient. Stems slender, $1\frac{1}{2}$-$2\frac{1}{2}$ cm. high, leaves crowded.—From the plain up to the snow-line over 3000 m. Collects humus, which subsequently affords a home for higher forms of plants. Common in Europe, North America, Tasmania and New Zealand.

Dicranoweisia crispula *Lindberg. Krause Perlmoos.* Plate 42, Fig. 3.—Grows in dense cushions, bright or dark-green above, black below.—Found in loose turf on siliceous

rocks where limestone is absent. Especially plentiful on boulders in thin larch and stone-pine woods in the upper forest region. Common in Europe, Asia and North America to the Arctic regions where it is found on the bare earth.

Grimmia alpestris *Schleicher. Alpen-Kissenmoos.* Plate 42, Fig. 4.—Grows in low, dense blackish-green tufts, with a glaucous tinge due to the hairy points of the leaves.—On primary rocks, where limestone is absent; on high mountain levels over almost all Europe, the Caucasus, and again in North America.

Rhacomitrium canescens *Bridel. Graue Zackenmütze.* Plate 42, Fig. 5.—Forms broad lax, dull-green or yellowish cushions, on worn rocks, gravel banks, and loose shingle, especially on the gravel and sand floors at the end of glaciers. Stems $2\frac{1}{2}$-10 cm. high.—Common in Europe to the remote North, in Northern Asia and America, the temperate parts of South America, New Zealand and Tasmania. On the Alps met with from the lower forest regions to the snow-line.

Splachnum sphaericum. *Linn. fil. Kugel-Schirmmoos* (Collar-moss). Plate 42, Fig. 6.—Grows on cow dung and in damp, shady places on meadows and slopes in the upper forest region.—In almost all mountainous districts of Europe from North Italy to Norway, and in North of North America.

Splachnum ampullaceum *L. Flaschen-Schirmmoos.* Plate 42, Fig. 7.—Stems slender, 1·2 to 2·5 cm. high.—Same habitat as the preceding species, but does not reach the Alpine level.

1. Sphagnum. 2. Andreaea petrophila. 3. Dicranoweisia crispula.
4. Grimmia alpestris. 5. Rhacomitrium canescens. 6. Splachnum sphaericum.
Splachnum ampullaceum. 8. Polytrichum alpinum. 9. Polytrichum juniperinum.
. Brachythecium glaciale. 11. Conocephalus conicus. 12. Preissia commutata.

Polytrichum alpinum *L. Alpen-Widerton* (Alpine Hair-moss). Plate 42, Fig. 8.—Grows on grassy surfaces and strips of rock in the forest region, and on the Alpine level. Often covers entire boulders in the lower parts of its habitat.

Polytrichum juniperinum *Willd. Wachholder-Widerton* (Bear's-bed, Ground moss, Juniper-leaved Hair-moss). Plate 42, Fig. 9.—Stems scattered, 2½-10 cm. high, gray-green leaves.—Grows on heath lands, thin meadows, and stony slopes from the valley to the Alpine level. Widespread and plentiful in almost all parts of the world.

Brachythecium glaciale *B. & S. Gletscher-Federmoos.* Plate 42, Fig. 10.—Short catkin-like branches, leaves overlapping. Favourite habitat in the neighbourhood of snow and on ground saturated with melted snow, on broken rocks and detritus from moraines.—From the Alpine level to the snow-line. Is found often spreading over a wide surface, throughout the Alpine chain and in the Pyrenees, also in Northern districts.

Conoscephalus conicus *Kegelköpfige Lebermoos.* Plate 42, Fig. 11.—Grows in patches of the size of a hand in watery places, banks of brooks, damp, shady spots, and on rocks throughout Europe, Central Asia, and North America. Emits a peculiar, strong scent, formerly used as a remedy in diseases of the liver.

Preissia Commutata *Felsen-Lebermoos.* Plate 42, Fig. 12.—Grows on damp rocks and slopes in the Alps, in patches of the size of a crown-piece to a hand; more rarely on swampy ground. Very rare on the plain.—In

Europe, North Asia and North America to the Frigid Zone.

LXII. Family: Lichenes (Lichens).

Usnea barbata. *Weber. Bartflechte* (Necklace-moss). Plate 43, Fig. 1.—A fruticose lichen hanging in short tufts or in longer "beards," sometimes a meter long from the branches of trees in mountain forests.—Found growing on the bark of trees almost all over the world.

Cladonia rangiferina. *Web. Renntierflechte* (Reindeer-moss). Plate 43, Fig. 2.—An erect fruticose lichen sometimes 4-10 cm. high, with scaly thallus, from which the branches grow, bearing the tiny brown apothecia on the tips. At times forms loose cushions or grey swards spreading over dry, sandy meadows which, in dry weather, crackle under the foot as though one were walking on brushes.—Widespread on the mountains of temperate regions and in northern lands, forming an important part of the lichen heaths and tundras affording nourishment to reindeer and other herbivorous animals.

Cladonia pyxidata. *Hoffm. Becherflechte* (Cup-moss). Plate 43, Fig. 3.—Thallus scaly; the hollow podetia, 2-3 cm. high, with cup-like widening; apothecia brown. —Grows on the earth among the moss, from the valley up to an elevation of over 3000 m. Dwarf forms only a few millimetres high are also found on rocks. A cosmopolitan species, found in various forms of growth over wide stretches of the earth's surface.

Cladonia bellidiflora. *Schœrer. Korallenflechte.* Plate 43, Fig. 4.—Fruiting branches (podetia) cylindrical; fruiting organs (apothecia) large.—Almost confined to high mountain levels on mossy, damp boulders and loose shingle. Conspicuous for its cushions of sealing-wax red fruit.

Thamnolia vermicularis *Acharius. Wurmflechte.* Plate 43, Fig. 5.—Looks like white worms growing among the moss and heather, where there is abundant humus.—Common on high mountain levels over the entire earth and in Polar regions.

Cetraria islandica *Ach. Isländische Moosflechte* (Iceland moss). Plate 43, Fig. 6.—A fruticose lichen, with a shrub-like thallus brown above, lighter below, growing in large clumps on dry, sunny, sandy spots and crevices in the rocks from the forest level up to over 3400 m., also in sparse woods.—Common on high mountain levels in the temperate zones and in Northern lands. When boiled with water forms a nutritious jelly affording a popular remedy for diseases of the lungs.

Solorina crocea *Ach. Safranflechte.* Plate 43, Fig. 7.—A foliaceous lichen, with a large thallus saffron yellow underneath, growing at an elevation of 1600-3400 m. between stones on primary rocks deficient in limestone. Also in other high mountain districts in Europe. A very similar species also known in the Himalayas.

Verrucaria calciseda *D.C. Kalk-Warzenflechte.* Plate 43, Fig. 8.—A crustaceous lichen, with thin, whitish thallus, forming great patches on rocky ground. Its habitat is confined to limestone districts, whether on mountain or on plain.

Verrucaria dolomitica *Massalongo. Dolomiten-Warzenflechte.* Plate 43, Fig. 9.—A crustaceous lichen, forming extensive, uniformly-coloured crusts on dolomitic and calcareous rocks. Thallus has a rosy tinge, gonidia bright green. Its coloration reminds one of old, weather-beaten guide-marks for mountaineers.

Rhizocarpon geographicum *D.C. Landkartenflechte* (Map-lichen). Plate 43, Fig. 10.—A pictorial lichen, forming remarkable, extensive, map-like patches on primary rocks where limestone is deficient. Thallus crustaceous, dark. Fruiting organs black.—Found from the plain to the highest summit, e.g. on Monte Rosa at 4638 m. above sea-level. Widely distributed on high mountain levels, also on erratic boulders of primary rock on the plain. Entirely avoids lime, hence an infallible guide to the geologist as to the nature of rocks.

Usnea barbata. 2. Cladonia rangiferina. 3. Cladonia pyxidata. 4. Cladonia
llidiflora. 5. Thamnolia vermicularis. 6. Cetraria islandica. 7. Solorina crocea.
Verrucaria calciseda. 9. Verrucaria dolomitica. 10. Rhizocarpon geographicum.

GLOSSARY.

Acicular, like needles, slender, stiff and pointed.

Acuminate, having a gradually diminishing point.

Amplexicaul, embracing the stem.

Annulate, surrounded with elevated rings or bands.

Apothecium, the fruiting organ of a lichen.

Aristate, with a fine hair-point.

Auriculate, having a pair of small, round lobes or ears.

Awn, a bristle-like appendage.

Axillary, growing in the angle between stem and leaf.

Bract, a modified leaf placed immediately below a flower or inflorescence.

Campanulate, approaching the shape of a bell.

Canaliculate, channelled.

Capitate, growing in heads.

Capitulum, a compact, head-like cluster of sessile florets.

Cernuous, drooping.

Ciliate, bordered with thick hairs.

Clavate, club-shaped, thickened towards the apex.

Claw, the long, narrow stalk of a petal.

Connate, united, separable only by tearing.

Connivent, converging towards the summit.

Cordate, shaped like an inverted ace of hearts.

Coriaceous, firm, dry, tough, leathery.

Corymb, an inflorescence having the flowers all on the same level, though their stalks are of unequal length.

Crenate, scalloped, having convex teeth.

Crustaceous, with the thallus like a thin crust.

Cuneate, wedge-shaped, triangular, with the point downwards.

Cyme, a branched, centrifugal inflorescence, in which the central terminal flower opens first and those on the lateral branches are successively developed.

Decumbent, lying on the ground.

Decussate, with pairs of opposite leaves placed at right angles with the next pair above or below.

Divaricate, extremely divergent.

Drupe, a fruit, fleshy without and more or less hard within.

Emarginate, having an apical indentation or notch.

Fascicle, a cluster of several things proceeding from the same point.

-fid, cleft to about the middle.

Fimbriate, fringed.

Foliaceous, with a leaf-like thallus.

Foliolate, bearing leaflets.

Fruticose, of a lichen, when the thallus branches like a shrub.

Fugacious, falling off early (petals, etc.).

Furcate, forked.

Fusiform, spindle-shaped, tapering to each end.

Geniculate, abruptly bent, like a knee-joint.

Glabrous, destitute of hairs.

Glumes, bracts enclosing the flowers of sedges and grasses.

Gonidium, an algal cell, green or blue-green, embedded in the thallus of a lichen.

Hastate, with pointed auricles divergent horizontally.

Imbricate, overlapping, like the tiles of a roof.

Infundibuliform, approximately funnel-shaped.

Involucre, a ring of bracts surrounding a group of flowers.

Keel, the united two lower and inner petals of a Papilionaceous corolla.

Lanceolate, narrow and tapering at both ends, like a lance-head.

Ligulate, strap-shaped, with the two margins parallel.

Limb, the expanded part of a corolla.

Linear, narrow, with parallel edges.

Loculi, cells or chambers of a fruit.

Lyrate, pinnatifid, with the terminal lobe large and rounded, the lower lobes small.

Mucronate, abruptly terminated by a hard, short point.

Napiform, turnip-shaped.

Nodulose, knotted.

Obcordate, shaped like the ace of hearts, having an apical depression.

Palate, the projection which closes the tube of a two-lipped flower.

Panicle, a branched raceme.

-partite, cleft to beyond the middle, but not to the base.

Pectinate, with numerous narrow, lateral lobes like the teeth of a comb.

Pedate, three-pronged, with the lateral prongs once or more forked.

Pedicel, stalk of a single flower.

Peduncle, stalk of a flower or of an inflorescence.

Perianth, the combined sepals and petals, similar to one another, and regarded as a single whorl.

Petiole, stalk of a leaf.

Podetium, the fruit-bearing stalk of a lichen.

Praemorse, appearing as if bitten off short.

Pubescent, downy, with short, soft hairs.

Raceme, an inflorescence with flowers arranged singly on pedicels along an undivided axis.

Rachis, the main stalk of a compound leaf.

Reniform, kidney-shaped.

Repand, with an uneven, slightly waved or angular margin.

Rostrate, beaked.

Runcinate, pinnately divided, with the lateral lobes curved backwards towards the base.

Saccate, bag-shaped.

Scape, a leafless flower-stalk, arising from the crown of the root.

Scarious, thin, transparent, chaffy, not green.

-sect, cleft down to the base.

Secund, turn to one side of the stem.

Serrate, with teeth regular and pointed.

Sessile, destitute of a stalk.

Setose, stiff, bristly.

Silicule, a short fruit-pod, as broad as long, in Cruciferæ.

Siliqua, the long, narrow fruit-pod of some Cruciferæ.

Sori, groups of sporangia or spore-cases.

Spatulate, broad near the top and narrow attenuated below, like a druggist's spatula.

Spike, an inflorescence of sessile flowers along an undivided axis.

Spur, a hollow, slender extension of some part of the flower.

Standard, the upper, outside, broad petal of a Papilionaceous corolla.

Stipules, leaf-like appendages at the base of a leaf-stalk.

Stolon, a long shoot or sucker creeping on the ground or underneath.

Striate, marked with parallel streaks.

Subulate, awl-shaped, tapering to a very fine point from a broadish base.

Tap-root, the main root which descends vertically into the earth.

Terete, cylindrical.

Ternate, with three lobes starting from the same point.

Thallus, the mass of vegetative cells of which Algæ, Fungi, and Lichens are formed. These **Thallophytes** have no stem, root, or leaves.

Tomentose, covered with dense, short, soft hairs, rather felted.

Truncate, with the end cut off square.

Umbel, a cluster of nearly equal flower-stalks radiating from a single point.

Ventricose, inflated usually on one side.

Villose, bearing long, weak hairs.

Wings, the two lateral, intermediate petals of a Papilionaceous corolla.

INDEX.

Achillea atrata, 51.
— moschata, 50.
— nana, 51.
— oxyloba, 52.
Aconitum Anthora, 10.
— Napellus, 9.
Adenostyles alpina, 46.
Akelei, 9.
Allermannsharnisch, 97.
Allium victorialis, 97.
Allosorus crispus, 102.
Alpendost, 46.
Alpendrottelblume, 85.
Alpenglöckchen, 85.
Alpenheide, 65.
Alpenhelm, 80.
Alpenlattich, 47, 57.
Alpenlilie, 96.
Alpenquendel, 80.
Alpenrachen, 77.
Alpenrebe, 1.
Alpenrose, 66.
Alpensalat, 57.
Alpenscharte, 55.
Alpenveilchen, 86.
Alpenwegerich, 87.
Alpine rose, 66.
Alsine Cherleri, 23.
— laricifolia, 23.
— verna, 22.
Alyssum Wulfenianum, 13.
Amelanchier vulgaris, 35.
Anacamptis pyramidalis, 91.
Andreæa petrophila, 105.
Androsace carnea, 82.
— glacialis, 82.
— helvetica, 82.
— imbricata, 81.
— villosa, 83.
Anemone, 1.
— alpina, 2.
— baldensis, 3.
Anemone Halleri, 3.
— narcissiflora, 2.
— sulfurea, 2.
— trifolia, 2.
— vernalis, 3.
Aposeris foetida, 56.
Aquilegia alpina, 9.
— atrata, 9.
Arabis alpina, 11.
— coerulea, 11.
— pumila, 11.
Arctostaphylos alpina, 64.
— Uva ursi, 64.
Arenaria biflora, 24.
— ciliata, 25.
— grandiflora, 24.
— laricifolia, 23.
— muscosa, 24.
— verna, 22.
Aretie, 83.
Armeria alpina, 87.
Arnica montana, 54.
Aronia rotundifolia, 35.
Aronicum glaciale, 54.
Artemisia Mutellina, 50.
— spicata, 50.
Arve, 90.
Asplenium ruta muraria, 103.
— septentrionale, 103.
— trichomanes, 103.
— viride, 102.
Aster, 47.
— alpinus, 47.
Astragalus alpinus, 31.
— astralis, 31.
— campestris, 30.
— montanus, 30.
Astrantia major, 44.
— minor, 44.
Atragene alpina, 1.
Auricula, 83.
Aurikel, 83.

Avena versicolor, 101.
Avens, 33.
Azalie, 65.

Bärentraube, 64.
Bärwurz, 45.
Bald-money, 45.
Baldrian, 46.
Bartschia alpina, 80.
Bastard Toadflax, 88.
Bearberry, 64.
Bedstraw, 46.
Beifuss, 50.
Bell-flower, 61.
Bellidiastrum Michelii, 47.
Berglinse, 29, 31.
Bergminze, 80.
Berufskraut, 48.
Bilberry, 64.
Bisam-Schafgabe, 50.
Biscutella laevigata, 15.
Bittercress, 12.
Blütenschraube, 94.
Bluttröpfl, 93.
Botrychium Lunaria, 104.
Brachythecium glaciale, 107.
Brändli, 93.
Braya alpina, 12.
Brillenschote, 15.
Bruchkraut, 37.
Brunnenkresse, 11.
Buckthorn, 28.
Bupleurum ranunculoides, 45.
Buttercup, 3.
Butterwort, 81.

Calamint, 80.
Calamintha alpina, 80.
Campanula alpina, 63.
— barbata, 63.
— pulla, 62.
— pusilla, 62.
— thyrsoidea, 61.
— Zoisii, 61.
Campion, Alpine, 22.
Cardamine alpina, 12.
— trifolia, 12.
Carex curvula, 100.
— firma, 100.
Catchfly, 21.
Cat's-ear, 57.
Cerastium alpinum, 26.
— latifolium, 25.
Cetraria islandica, 109.
Cherleria sedoides, 23.
Cherlerie, 23.
Chickweed, 25.
Christblume, 8.
Christmas Rose, 8.
Chrysanthemum alpinum, 52.
— atratum, 52.
Cinquefoil, 33.
Cladonia bellidiflora, 109.
— rangiferina, 108.
— pyxidata, 108.
Cochlearia saxatilis, 14.
Columbine, 9.
Conoscephalus conicus, 107.
Cortusa Matthioli, 85.
Cotton-grass, 99.
Cowberry, 63.
Cranberry, 64.
Crane's-bill, 27.
Crepis alpestris, 58.
— aurea, 58.
— jubata, 58.
Crocus vernus, 95.
Crowfoot, 3.
Cudweed, 49.
Currant, 39.
Cyclamen europaeum, 86.
Cyphel, 23.
Cypripedium Calceolus, 94.
Cystopteris regia alpina, 103.

Daffodil, 95.
Daisy, Alpine, 47.
Daphne Cneorum, 88.
— striata, 88.
Delphinium elatum, 9.
Dentaria digitata, 12.
Dianthus alpinus, 19.
— barbatus, 20.
— Carthusianorum, 20.
— glacialis, 19.
— inodorus, 19.
Dicranoweisia crispula, 105.
Dog's-tooth, Violet, 96.
Dorant, 77.
Doronicum cordatum, 53.
— Pardalianches, 53.
Douglasia Vitaliana, 83.
Draba aizoides, 13.
— Hoppeana, 14.
— Zahlbruckneri, 14.
Drachenmaul, 80.
Drahtstengel, 56.
Dryas octopetala, 32.

Edelraute, 50.
Edelweiss, 49.
Ehrenpreis, 75.
Eisenhut, 9.
Empetrum nigrum, 89.
Enzian, 68.
Epilobium rosmarinifolium, 36.
Epipactis latifolia, 93.
Eranthis hiemalis, 8.
Erdscheibe, 86.
Erica carnea, 65.
Erigeron alpinus, 48.
— uniflorus, 48.
Erinus alpinus, 75.
Eriophorum Scheuchzeri, 99.
Eritrichium nanum, 74.
Eryngium alpinum, 44.
Erythronium Dens-canis, 96.

Fahnenwicke, 30.
Faltenlilie, 95.
Felsenbirne, 35.
Felsen-Mispel, 35.
Felsen-Rose, 35.
Ferkelkraut, 57.
Fettblatt, 37.
Fettkraut, 81.
Feuerlilie, 96.
Fingerkraut, 33.
Flax, Alpine, 26.
Flea-bane, 48.
Forget-me-not, 74.
Frauenschuh, 94.
Frauenthräne, 91.

Gänsekresse, 11.
Gagea Liottardi, 96.
Galium, 46.
Gemskresse, 15.
Gemswurz, 53.
Gentian, 68.
Gentiana acaulis, 68.
— asclepiadea, 70.
— bavarica, 68.
— brachyphylla, 71.
— ciliata, 73.
— excisa, 68.
— frigida, 70.
— lutea, 68.
— nana, 73.
— nivalis, 72.
— pannonica, 69.
— prostata, 72.
Gentiana pumila, 71.
— punctata, 69.
— purpurea, 69.
— utriculosa, 72.
— verna, 71.
Geranium argenteum, 28.
— macrorrhizum, 27.
Germer, 98.
Geum montanum, 33.
— reptans, 33.
Gipskraut, 18.
Gletscher-Weide, 89.
Globe-flower, 8.
Globularia cordifolia, 86.
Glockenblume, 61.
Gnaphalium norvegicum, 49.
— supinum, 49.
Goldprimel, 83.
Goldstern, 96.
Grasnelke, 87.
Grass of Parnassus, 17.
Grimmia alpestris, 106.
Gymnadenia albida, 92.
— conopea, 92.
Gypsophila repens, 18.

Habichtskraut, 59.
Hacquetia Epipactis, 43.
Hahnenfuss, 3.
Hainsimse, 99.
Hare's-ear, 45.
Hasenohr, 45.
Hauswurz, 38.
Hawk's-beard, 58.
Hawk-weed, 59.
Heartsease, 17.
Heath, 65.
Hedysarum obscurum, 32.
Heide, 65.
Heidelbeere, 64.
Heideröschen, 88.
Heilglöckchen, 85.
Helianthemum alpestre, 15.
— oelandicum, 15.
Helleborine, 93.
Helleborus niger, 8.
Herniaria alpina, 37.
Herzblatt, 17.
Hieracium alpinum, 59.
— aurantiacum, 59.
— villosum, 59.
Himmelsherold, 74.
Himmelsleiter, 73.

Holly, 67.
Homogyne alpina, 47.
Horminum pyrenaicum, 80.
Hornkraut, 25.
Höswurz, 92.
House-leek, 38.
Hundskamille, 52.
Hundszahn, 96.
Hungerblümchen, 13.
Hutchinsia alpina, 15.
Hypericum Coris, 27.
— Richeri, 27.
Hypochoeris uniflora, 57.

Ilex aquifolium, 67.
Iva, 50.

Jacob's-ladder, 73.
Johannisbeere, 39.
Johanniskraut, 27.

Klee, 28.
Knabenkraut, 90.
Knieholz, 90.
Knöterich, 87.
Krähenbeere, 89.
Kreuzblume, 18.
Kreuzdorn, 28.
Kreuzkraut, 54.
Kronsbeere, 63.
Kuckucksblume, 92.
Kugelblume, 86.
Kuhtritt, 77.

Labkraut, 46.
Ladies' tresses, 94.
Lady's slipper, 94.
Läusekraut, 77.
Larkspur, 9.
Latsche, 90.
Leberbalsam, 75.
Legföhre, 90.
Leimkraut, 21.
Lein, 26.
Leinblatt, 88.
Leinkraut, 75.
Lent-lily, 95.
Leontodon pyrenaicus, 56.
Leontopodium alpinum, 49.
Leopard's-bane, 53.
Lichtnelke, 22.
Ligusticum Mutellina, 45.
Lilium bulbiferum, 96.
— carniolicum, 97.
— Martagon, 97.
Lily, 97.
Linaria alpina, 75.
Linnaea borealis, 45.
Linum alpinum, 26.
Listera ovata, 94.
Lloydia serotina, 95.
Löffelkraut, 14.
Loiseleuria procumbens, 65.
Löwenzahn, 56.
Lousewort, 77.
Luzula lutea, 99.
Lycopodium selago, 104.

Männerle, 76.
Männertreue, 44.
Mannsschild, 81.
Massliebchen, 47.
Meadow Rue, 1.
Mehlprimel, 83.
Miere, 22.
Milfoil, 50.
Milk-vetch, 31.
Milkwort, 18.
Moehringia muscosa, 24.
Mohn, 10.
Monkshood, 9.
Montia minor, 36.
Moosebeere, 64.
Moss-campion, 22.
Mouse-ear Chickweed, 25.
Mulgedium alpinum, 57.
Myosotis alpestris, 74.

Nadelgras, 87.
Narcissus Pseudonarcissus, 95.
Nardus stricta, 101.
Narzisse, 95.
Nasturtium pyrenaicum, 11.
Nelke, 19.
Nelkenwurz, 33.
Niesswurz, 8.
Nigritella nigra, 93.

Ophrys aranifera, 91.
— muscifera, 91.
Orchis, Butterfly, 92.
— Dark-winged, 90.
— Fly, 91.
— globosa, 91.
— Spider, 91.

Orchis, ustulata, 90.
Oxytropis campestris, 30.
— caerulea, 30.
— Jacquini, 30.
— montana, 30.
— sordida, 30.

Paeonia officinalis, 10.
Pansy, 17.
Papaver alpinum, 10.
— pyrenaicum, 10.
Paradisia Liliastrum, 96.
Parnassia palustris, 17.
Pedicularis incarnata, 78.
— Oederi, 79.
— recutita, 79.
— rostrata, 77.
— tuberosa, 79.
— verticillata, 78.
Penny-cress, 14.
Peony, 10.
Petrocallis pyrenaica, 13.
Pfingstrose, 10.
Phaca alpina, 30, 31.
— australis, 31.
— frigida, 29.
Phleum alpinum, 101.
Phyteuma comosum, 60.
— hemisphaericum, 61.
— pauciflorum, 60.
Pinguicula alpina, 81.
— vulgaris, 81.
Pink, 19.
Pinus Cembra, 90.
—Pumilio, 90.
Pippau, 58.
Plantago alpina, 87.
Plantain, 87.
Platanthera bifolia, 92.
Poa alpina, 101.
Polemonium caeruleum, 73.
Polygala Chamaebuxus, 18.
Polygonum viviparum, 87.
Polytrichum alpinum, 107.
— juniperinum, 107.
Poppy, 10.
Potentilla Clusiana, 34.
— frigida, 34.
— grandiflora, 34.
— nitida, 33.
Preisselbeere, 63.
Preissia commutata, 107.
Primrose, Bird's-eye, 83.
Primula Auricula, 83.
— farinosa, 83.
— glutinosa, 84.
— longiflora, 84.
— minima, 85.
— villosa, 84.
Prunelle, 93.
Pyrola secunda, 67.
— uniflora, 67.

Quellenkraut, 36.

Rampions, 60.
Ranunculus aconitifolius, 6.
— alpestris, 5.
— anemonoides, 4.
— crenatus, 6.
— glacialis, 4.
— montanus, 7.
— parnassifolius, 4.
— pygmaeus, 7.
— pyrenaeus, 4.
— roseus, 5.
— rutaefolius, 3.
— Seguieri, 5.
— Thora, 7.
— Traunfellneri, 6.
Rapunzel, 60.
Rauschbeere, 89.
Rhacomitrium canescens, 106.
Rhamnus alpina, 28.
— saxatillis, 28.
Rhizocarpon geographicum, 110.
Rhododendron ferrugineum, 66.
— hirsutum, 66.
Rhodothamnus Chamaecistus, 66.
Ribes petraeum, 39.
Rittersporn, 9.
Rock-cress, 11.
Rock-rose, 15.
Rosa alpina, 35.
Rose Alpine, 35.
Rosenwurz, 37.
Rose-root, 37.
Ruhrkraut, 49.
Rupture-wort, 37.

Safran, 95.
St. John's Wort, 27.
Salix herbacea, 90.
— reticulata, 89.
Sandwort, 24.
Saponaria ocymoides, 20.

Saponaria Pumilio, 21.
Saussurea alpina, 55.
— pygmaea, 56.
Saxifraga aizoides, 40.
— aizoon, 42.
— androsacea, 40.
— biflora, 43.
— bryoides, 41.
— Burseriana, 42.
— caesia, 41.
— oppositifolia, 42.
— rotundifolia, 39.
— Seguieri, 40.
— stellaris, 40.
Saxifrage, 39.
Scabiosa graminifolia, 46.
— longifolia, 46.
— lucida, 46.
Scabious, 46.
Schaumkraut, 12.
Schotenkresse, 12.
Schwarzstendel, 93.
Scurvy-grass, 14.
Sedum annuum, 37.
— roseum, 37.
Seidelbast, 88.
Seidenröschen, 33.
Seifenkraut, 20.
Selaginella denticulata, 105.
— helvetica, 104.
Sempervivum arachnoideum, 38.
— montanum, 38.
— Wulfeni, 38.
Senecio abrotanifolius, 54.
— Doronicum, 55.
— incanus, 55.
Sesleria caerulea, 102.
Siegwurz, 97.
Silberwurz, 32.
Silene acaulis, 22.
— rupestris, 21.
— saxifraga, 21.
Simsenlilie, 98.
Soapwort, 20.
Soldanella alpina, 85.
— pusilla, 86.
Solorina crocea, 109.
Sonchus alpinus, 57.
Sonnenröschen, 15.
Speedwell, 75.
Sperrkraut, 73.
Sphagnum, 105.
Spiranthes spiralis, 94.
Splachnum ampullaceum, 106.
Splachnum sphaericum, 106.
Star of Bethlehem, 96.
Stechpalme, 67.
Steinbrech, 39.
Steinkraut, 13.
Steinröschen, 88.
Steinschmückel, 13.
Sterndolde, 44.
Stiefmütterchen, 13.
Stinksalat, 56.
Stonecrop, 37.
Storchschnabel, 27
Sumpfheidelbeere, 64.
Sumpfwurz, 93.
Süssklee, 32.

Täschelkraut, 14.
Thalictrum alpinum, 1.
— aquilegifolium, 1.
— foetidum, 1.
Thamnolia vermicularis, 109.
Thesium alpinum, 88.
Thlaspi alpinum, 14.
— rotundifolium, 14.
Toad-flax, 75.
Tofieldia palustris, 98.
Toothwort, 12.
Tozzia alpina, 77.
Trichophorum caespitosum, 100.
Trichterlilie, 96.
Trifolium alpinum, 28.
— badium, 29.
— pallescens, 29.
Trollblume, 8.
Trollius europaeus, 8.
Türkenbundlilie, 97.
Turk's-cap Lily, 97.
Twayblade, 94.

Usnea barbata, 108.

Vaccinium Myrtillus, 64.
— Oxycoccos, 64.
— uliginosum, 64.
— Vitis idaea, 63.
Valerian, 46.
Valeriana supina, 46.
Veilchen, 16.
Veratrum album, 98.
— Lobelianum, 98.
— nigrum, 98.
Vergissmeinnicht, 74.
Veronica alpina, 76.
— Bonarota, 76.
— fruticans, 76.

Veronica fruticulosa, 75.
Verrucaria calciseda, 109.
— dolomitica, 110.
Viola alpina, 17.
— biflora, 16.
— calcarata, 16.
— pinnata, 16.
— tricolor, 17.
Violet, 16.
Viscaria alpina, 22.

Weidenröschen, 36.
Wendelorchis, 94.
Whitlow-grass, 13.
Whortleberry, 64.
Wiesenraute 1.
Wildfräuleinkraut, 50.
Willow, 89.
Willow-herb, 36.
Wind-flower, 2.
Winter Aconite, 8.
Winter-green, 67.
Wintergrün, 67.
Winterstern, 8.
Wohlverleih, 54.
Wollgrass, 99.
Wood-pink, 19.
Woodrush, 99.
Wormwood, 50.
Wucherblume, 52.
Wulfenia carinthiaca, 77.
Wulfenie, 77.

Yarrow, 50.

Zahlbrucknera paradoxa, 43.
Zahnwurz, 12.
Zirbelkiefer, 90.
Zweiblatt, 94.
Zwergprimel, 85.

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